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National Center for Geographic Information and Analysis

Geographic Information/GIS Institutionalization in the 50 States: Users and Coordinators

by

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S-92-2: GEOLINEUS, developed by David Lanter, UCSB (updated 12/93).
S-92-3: LADSS, or Locational Analysis Decision Support System, developed by Paul Densham, SUNY-Buffalo.
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This report represents a cooperative and long-term effort which extends over ten years. My collection and analysis of information about GI/GIS activities in states began in 1984 while I was a Wyoming budget analyst searching for effective strategies for maximizing GI/GIS potential. Since 1988, I have conducted multiple research projects analyzing GI/GIS conditions in the 50 states, with particular attention to policy and institutional matters in a broad government context. The most extensive of these projects was the State Geographic Information Activities Compendium, published by the Council of State Governments in 1992.

Information herein is specifically derived from reports prepared under contracts to, or with financial support from several organizations. The reports are: (1) “Geographic information/GIS institutionalization in the 50 states: Organizational charts diagram users and coordinating entities” (U.S. Geological Survey, Purchase order 022534-921), and (2) “Impact of geographic information and related technologies on government: The role of state governments and institutionalization “(Ph.D. dissertation, 1995, State University of New York, Lisa Warnecke). Some information from these reports has been updated with funding provided by the National Center for Geographic Information an Analysis (NCGIA) in Santa Barbara, California. The current report provides the name, address, and telephone number for a GI/GIS coordinator or other appropriate official in each of the 50 states. Compilation of that information was funded by the National States Geographic Information Council (NSGIC). Views expressed in the current report are those solely of the author and do not reflect the policies, views, or standards of the agencies, organizations, or their affiliates that funded or provided data for the original work.

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Abstract

This report analyzes recent information about the use and institutionalization of geographic information and related technologies such as geographic information systems (GIS), satellite imagery and the global positioning system (GI/GIS) in the 50 state governments. The devolution of federal responsibilities and activism by state governments are increasing the role of states in GI/GIS, as well as in the nation's governance in general.

An organizational chart for each state was prepared from data provided by state officials. The charts show GIS users, GI/GIS coordinators, and the organizational structure in each state government's executive branch. These charts and other information are synthesized to (1) categorize state GI/GIS users according to a classification of state government functions, and (2) determine the incidence, authorization and administrative location of statewide GI/GIS coordinators. Tables, figures and contact information for each of the states supplement the charts.

The results indicate GI/GIS is being applied throughout state governments, and that GI/GIS catalyzing the establishment of new coordination entities in state governments. Between 1985 and 1995, the number of states with GI/GIS coordinators grew from 17 to 41. The coordinators are increasingly authorized by legislative or gubernatorial action. Most GI/GIS coordinators were originally in agencies with natural resources responsibilities; however, they are increasingly located in agencies with government-wide roles. Twenty six of the 41 coordinators in 1995 are administratively located in one of these agencies; 18 of them are in an agency with statewide information or information technology responsibilities.

The results of this research is significant for practitioners and researchers alike. The importance of institutional GI/GIS conditions is increasingly indicated; however, research on this topic is limited. Although the focus of this report is on GI/GIS in states, the findings are also relevant in the practice and study of government, federalism, intergovernmental relations, and information technology policy and implementation, and as well as for the federal and local governments.

Preface

There can be no doubt that State governments are important users of geospatial information. In the 1960s some of the earliest institutional users of geographic information systems were States, e.g., New York and Pennsylvania. At that time computing was main frame based and, relatively speaking, expensive. Yet these early systems did serve, along with the Canadian Geographic Information System (CGIS), as initial demonstrations of the potential of GIS technology for governmental applications. As the price performance of GIS hardware and software improved and the number of demonstrated applications to State level needs increased, so too did the adoption of GIS technology.

Yet, the adoption of a new technology within an institutional framework is a very complex process. Research publications, to date, on factors influencing the adoption of GIS technology, are very few and far between. This work addresses the new realities facing both State and Federal Agencies alike today. Decreasing resources and a drive to reduce duplication and redundancy are facts of life. Government Agencies at all levels are beginning to look at ways to cooperate rather than compete. This process is operating better at some levels and in some institutions than others.

Geographic Information Systems and geospatial analysis are areas where the process seems to be working better than most. Indeed, GIS is being seen in many areas as the glue that can bind Agencies together in the maintenance and use of common databases. GIS coordination mechanisms are being set up in States across this Nation. This important work details the process that has gone on in the States over the last ten years. It addresses not only the question of what happened, but also the why. It is "must" reading for anyone wishing to understand what is happening in GIS today at the State Level.

John E. Estes
Washington D.C.

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Table of Contents

Chapter 1. Introduction 1

Chapter 2. Background and Context 2

2.1 Societal and Governing Trends Stimulate Change 2
2.2 Federalism and Intergovernmental Relations Grow in Importance 2
2.3 States Strengthen in Our Federal System of Governance 3
2.4 State Government Institutions and Structures 4
2.5 Increasing Government Coordination and Integration 5
2.6 Information and Information Technologies in States 7

Chapter 3. GI/GIS Institutionalization in State Governments 9

3.1 Scope and Use of GI/GIS 9
3.2 Scope of "State" Approach 10
3.3 State GI/GIS Authorization, Direction and Accountability 10
3.4 Financial and Personnel Resources for GI/GIS 11
3.5 State GI/GIS Coordination Groups 12

Chapter 4. Report Scope and Caveats 14

4.1 GIS Users 14
4.2 GI/GIS Coordinators 15
4.3 Organizational Chart Design and Characteristics 16

Chapter 5. Methodology 18

Chapter 6. Findings and Analysis 21

6.1 GIS Users in State Executive Branches 21
6.2 Statewide GI/GIS Coordinators 22
6.3 Incidence of State GI/GIS Coordinators 22
6.4 Authorization of State GI/GIS Coordinators 23
6.5 Roles and Activities of State GI/GIS Coordinators 24
6.6 Administrative Location of State GI/GIS Coordinators 24
6.7 External and State Government Factors Explain GI/GIS Institutionalization 32
6.8 Trends and Future Conditions 35

Chapter 7. Conclusions and Implications 37

7.1 Summary of Findings 37
7.2 Significance of Research and Results 38

7.3 Implications, Issues and Future Challenges 39
7.4 Future Research Needs 41

Bibliography 43

List of Attachments 45

1. Introduction

Use of geographic information and related technologies such as geographic information systems, satellite imagery, the global positioning system and others (GI/GIS), is increasing in many sectors of society. As use accelerates and matures, government attention focuses on how GI/GIS can be more cost effective and worthwhile for government functions. The need for accurate, current and applicable data, and the need to reduce data redundancies, gaps and costs, encourage governments to coordinate GI/GIS activities.

Knowledge and understanding of GI/GIS institutionalization is limited, however it affects many internal activities and relations with other governments and organizations. Investigation of these conditions in states is particularly needed today. States are in crucial positions within our nation's form of governance because they have their own sanctioned responsibilities that are not necessarily shared with the federal government. In addition, the federal government is devolving responsibilities to states and others. State government activism is increasingly evidenced in many aspects of governance. State GI/GIS institutionalization seems to reflect this state leadership evident in other government functions and areas. Moreover, states may be emerging as leaders of national GI/GIS coordination.

This project was initiated to build on past work over the last ten years to provide practitioners and researchers alike with an easy-to-use "window" into GI/GIS institutional conditions in each of the 50 states. Its goal is to illustrate varying GI/GIS coordination structures as they meet individual state needs, thereby aiding state officials in improving the potential and practice of GI/GIS coordination in, among and with states. Synthesis and analysis of these conditions can provide information about changes and trends among all states that is also useful for other governments and organizations in the institutionalization of GI/GIS coordination.

2. Background and Context

GI/GIS conditions in states are influenced by several converging trends. These trends provide insight to understand the approach used in this research.

2.1 Societal and Governing Trends Stimulate Change

Society is experiencing an increase in global interdependency. Governments address more complex problems concerning the natural, physical and human environment, compounded by growing fiscal limitations. Within the United States, federal, state and local governments often address related problems independently. However, the pace of societal and government change is also accelerating. These changes challenge many of our customs and institutions.

Several recent government changes are being experienced simultaneously. Numerous governments have been "reinventing" or "reengineering" their operations. Governments are newly focused on citizen needs and are attempting to increase their input in decision making, particularly as public discontent and distrust of government has increased. Initiatives to limit the scope, authority and expenditures of government have growing public support. Many officials elected in 1994 advocate government "downsizing," particularly at the federal level.

Recent efforts are underway to decentralize and devolve government decision making and operations. Both centralizing and decentralizing trends were observed in the past, with the federal government taking a leading role in some matters, and states or localities exerting initiative in others. Today, several federal agencies are being decentralized and many headquarters staff are being reassigned to field offices. At the same time, authorities, roles and responsibilities of the federal government are being devolved to state and local governments. In addition, there is also a devolution from governments to markets, the private sector and non-governmental organizations.

Other government trends seem to complement government decentralization and devolution trends. Public and private organizations alike are reducing and "flattening" their institutional hierarchies to minimize costs and time while maximizing technological capabilities and overall effectiveness. Interorganizational networking and coordination is being emphasized over traditional hierarchies, as seen by the increasing strength of interorganizational groups. Financial limitations continue to stimulate change.

2.2 Federalism and Intergovernmental Relations Grow in Importance

The United States government is characterized by two sets of checks and balances. These occur in the horizontal dimension, in which the three federal branches share authority. They also occur in the vertical dimension, in which state governments have specific powers in relation to the federal government, known as "federalism". In contrast to a unitary system, where a nation's central government has authority over subnational governments, state governments share in the balance of power and roles. Localities also have roles and authorities, as authorized by state statutes or home rule provisions.

Federalism is thriving as a form of government throughout the world. About 70% of the world's population lives in countries that are federal or apply federal arrangements (Elazar 1990).

Federalism is a key factor in the institutionalization of GI/GIS in the U.S. because each level of government has different interests, roles and authorities. In practice, division of governing roles and responsibilities may be unclear. Accordingly, numerous governmental actors address related issues, and each has directives and programs that may be unique, duplicative or conflicting.

Federal authority has been devolving to states and localities in many areas of public policy since the 1970's, resulting in shared implementation of many federal programs. Recent and expected federal legislation, such as the 1990 Clean Air Act, sets minimum national standards and objectives, while states have strengthened roles, responsibilities and discretion to design and implement their own laws and programs. (Lester 1994) Furthermore, some federal legislation finances state programs where federal jurisdiction is limited, such as forestry programs on private lands. In these cases, states serve as "arms" of the federal government, with state counterparts empowered or newly established to implement Federal legislation and programs. Devolution of federal roles is accelerating since the 1994 election.

The growth of federalism is also apparent in the increasing state and local protests against federal preemptions, regulations and "unfunded mandates." In the past, plentiful federal grants largely determined the tone and structure of intergovernmental relations, and states and localities seemed more satisfied with strong federal government roles. However, during the 1990's, state and local officials documented growing federal mandate costs and advocated corrective action. While it is often acknowledged that federal mandates can have important public policy objectives, they may prescribe a remedy that fails to recognize local conditions where federal regulations may not apply, local issues represent greater priority, and less expensive alternatives may exist (Moran 1994). In response, President Clinton signed executive orders limiting the impact of federal mandates on states and localities in 1993. However, state and local officials worked to achieve passage of the Unfunded Mandate Reform Act (P.L. 104-04), which was signed into law on March 22, 1995.

2.3 States Strengthen in Our Federal System of Governance

The importance of states relative to the federal government is increasing due to federal devolution and decentralization. In addition, changes in the relationships between states and localities are also increasing the role of states in the nation's governance. Direct federal relations with localities programs are diminishing in several areas, and states are replacing federal programs for local programs in some areas.

An important feature of our government is that localities are "creatures of the states" because they are legally created and empowered by states, and are not mentioned in the U.S. Constitution. All states establish localities and determine how much authority their localities can exercise. Thus each state has localities with different characteristics. States have generally increased their roles concerning local governments by improving interlocal coordination and local capacities, such as in financial and personnel management. States have also interceded in some areas traditionally under local jurisdiction, such as land use planning and telecommunications regulation, and have transferred local authority to themselves in other areas, such as judicial services and jails.

> Evidence is growing that states are experiencing an overall "renaissance." States are increasing their leadership, capacity, initiative and innovation in forming and implementing policy objectives. States are becoming important actors in new areas, including those traditionally within the federal domain, such as international trade and regulation of environment and commerce, and have largely defined and implemented the domestic agenda since the 1980's (Kamensky 1989). States are taking recent action on important issues with which the federal government has had difficulty, such as health care and legal reform.

2.4 State Government Institutions and Structures

The growing importance of states, due to their own initiatives and federal influence, is also apparent in maturation of their institutional capacities to implement public policy. Institutionalization is needed to implement public policy, and organizational structure of government institutions significantly impacts government actions and results (Ringquist 1993).

Previous research concluded that states were largely "ill suited to accept or carry out an expanded role within the federal system" (Ringquist 1993, 63). However, since about 1960, "almost every facet of state government structures and operations have been transformed." States have revised constitutions, professionalized legislatures, strengthened governor's offices, reorganized executive branches, reformed courts, improved fiscal capabilities and revenues through tax diversification, and provided greater opportunities for citizen participation (Lester 1994).

States initiate executive branch reorganizations and other institutional changes, particularly to improve efficiency. The national trend is toward reduction in the number of departments, agencies, boards, commissions, and to a lesser degree, elected officials. Agencies with related functions are being consolidated within a cabinet or under a secretary. This reduces the number of individuals who report to the governor and expands gubernatorial jurisdiction (Chi 1992).

Reorganization of state government is difficult, time consuming and infrequent. Sometimes, the implemented changes only partially reflect original intentions. Accordingly, many states continue to have over 100 independent agencies, boards and commissions, even after reorganization. Not all functions are directly under the Governor's jurisdiction, as these groups or other elected officials may lead them. Knowledge of the impact of these separate jurisdictions is limited. Roles and responsibilities frequently seem shared, duplicated, unclear, de facto, or non-existent in individual states.

Changing roles and relationships of executive branch departments and agencies can require altering legal foundations, such as constitutional and statutory provisions and executive orders. Aside from obvious practical difficulties in changing directives, many stakeholders seek to maintain the status quo, to preserve their own autonomy and linkage to elected officials and funding sources. These conditions, in addition to state entrepreneurship and federal influences described above, result in differences in the structure of each state government. This makes it difficult to compare, categorize and evaluate state government structures.

2.5 Increasing Government Coordination and Integration

Societal and government direction are encouraging heightened awareness, coordination and integration within and among governments to improve connectivity, effectiveness and efficiency. Heightened awareness may result in efforts to eliminate redundant, overlapping or conflicting mandates and programs. Related institutional roles, responsibilities and conditions may be redefined or consolidated among various federal, state or local agencies. Other coordination processes and mechanisms may be instituted to supplement structural changes, such as interorganizational agreements, groups, networks and information clearinghouses.

Focus of these coordination and integration efforts is often directed toward certain related governing functions in individual or multiple governments. For example, strong coordination exists between federal, state and local governments concerning transportation and criminal justice functions. Coordination of social, human and health services is an important goal shared by many governments today, particularly as it is the area with the greatest government expenditures. For example, over 20 different government entities can provide human services programs, while up to half of assistance funds may be used to support administration of these programs. State institutional change and coordination is accompanying these coordination efforts, including attention by states collectively. For example, a National Governors' Association study (1993) found that states are adopting various approaches. Approximately 30 states have interagency councils related to human services.

The above trends specifically encourage coordination of environment and natural resources (ENR) planning and management. ENR authority, roles and responsibilities have been shared by federal, state and local governments. Unprecedented changes have occurred in the 1990's that will dramatically shift responsibilities and coordination leadership to state governments. Evidence of state assertiveness and leadership in ENR exists in many respects. States are integrating policy direction, planning and regulation, while also passing laws in areas lacking federal direction. State ENR reorganizations reflect integration trends, for example a reduction in the number of agencies addressing ENR, and possible creation of one or more ENR agencies that are more comprehensive in scope. This can result in designation of an omnibus or leading ENR organization (Warnecke 1994). Several natural resources information systems (NRISs) were established in the states in the 1970's and 1980's to integrate ENR data. Many of these systems became the earliest users of GI/GIS in their state government.

Despite coordinating trends, many state agencies traditionally operate in an independent manner. However, states increasingly establish administrative systems and internal support offices that help to integrate many, if not all executive branch agencies. For example, financial constraints are causing uniform budgeting, accounting and other financial systems to be developed for all agencies. Common personnel, purchasing, and asset and property management are among the other administrative areas being modernized and integrated to improve efficiency and accountability.

Some integrating government roles, such as planning, economic development, ecosystems management and emergency management, encourage "horizontal" coordination among agencies within the same government, as well as "vertical" coordination with other levels of government. These integrating functions also stimulate coordination and integration of both similar and otherwise disparate data and GI/GIS activities.

2.5.1 Planning

Over time, governments have strengthened their focus, direction and efforts regarding land planning, particularly concerning the environment, natural resources, transportation and land use. These efforts have facilitated government, information and GI/GIS coordination and integration in various ways.

Though planning has been encouraged and legislated in various ways among federal, state and local agencies, it seemed stymied in its early days. Efforts often produced large documents that were static, hard to change, inflexible and difficult to implement, particularly with conditions changing. Public participation was often encouraged or required, but was difficult to incorporate into planning processes. Along with private sector complaints, and growing fiscal limitations, this seemed to reduce planning effectiveness.

Localities typically have authority over land use, as institutionalized through zoning and subdivision laws and review. However, planning encourages attention and actions for larger geographic areas, often requiring interlocal and state approaches. State activism has resulted in planning initiatives and institutions, recently to facilitate growth management. By 1993, 24 states had "some form of mandatory planning for state agencies or regional or local governments" (Cobb 1994, 1). Many of these states are using GI/GIS internally, or directing, facilitating or funding GI/GIS in local governments to coordinate data for planning processes. Planning encourages integration of data from multiple sources, GI/GIS development and commonality, and GI/GIS use to analyze conditions and develop scenarios. While government planning can be controversial and cyclical, with recent political trends minimizing planning efforts, many planning processes have been institutionalized and may not be reduced significantly or easily.

2.5.2 Economic Development

Economic development efforts can similarly facilitate government, information and GI/GIS coordination and connectivity within and among governments. It is also a leading example of state activism and leadership, particularly when compared to the federal government. An important component of economic development efforts is the provision of accurate, current and integrated information from various sources. GI/GIS is increasingly employed to provide information in a format that is easy to use, update and analyze. Like planning, meeting this need has often facilitated connectivity between states and their localities.

2.5.3 Emergency Management

While governments face fiscal constraints, the U.S. has recently experienced more natural disasters and other emergencies than in past years. Accordingly, the perceived need for government action and coordination in emergency preparedness and management has grown. Though the 1995 Congress is actively reducing most federal programs, support for emergency management has been more stable.

Several information and GI/GIS initiatives have grown among state, local and federal agencies to meet emergency management objectives. Similar to planning and economic development activities, various data may be needed in a format that can be integrated effectively, including for natural resources, transportation, utilities and socioeconomic conditions. In particular, current and coordinated data are often necessary to meet emergency response requirements. Institutional coordination can be facilitated to meet emergency management objectives.

2.6 Information and Information Technologies in States

Our industrial society is being replaced by an information society in which information has increasing value, importance and power. Information and information technologies (IT) are often developed and used by organizations in isolation of other entities. However, governments and the public are increasingly aware of redundant and incompatible information that may conflict and cannot be integrated or analyzed effectively. Recent government efforts are facilitating public access to data; however, an emerging issue is that data dissemination mechanisms of individual agencies could mirror and accentuate fragmented information systems.

The "information society" impacts individual governments, as well as their institutions and relationships. While computers have been widely used in government since the 1970's, they primarily provided an efficient way to automate existing administrative processes. More recent benefits have been realized from the conversion of data into information, and the expanded use of information and information technologies (IT) to help solve government problems, and provide services more effectively. However, research on the impacts of information and IT on governments, organizations and intergovernmental relations is limited.

The federal government, all state governments and most local governments have institutionalized processes for direction and operations concerning information and some or all IT, including data processing, telecommunications and office automation operations. At the federal level, this integrated approach is commonly known as information resources management (IRM), though this term has not been commonly adopted in state and local governments.

Each state government has at least one office responsible for some government-wide direction concerning information or IT. Trends indicate that states are consolidating all types of IT in one agency. State information policy, planning and coordination functions may reside in the same or different organization as IT operations. In some states, policy functions are funded through general appropriations, while charges for mainframe computing or other IT operations subsidize these functions in other states. Statewide information policy functions are often directed by an interagency group, usually comprised of agency directors, their designees, private sector representatives and/or IT directors.

State information policy focus is generally on the executive branch, although some also include the legislative and judicial branches, and a few address intergovernmental issues (e.g. Nebraska). Potentially, more states will consider localities to improve their access to the "information highway" and federal information activities impacted by devolution. The authorization and authority of information and IT offices vary by state. Some have strong oversight in the IT activities of individual agencies and others have primarily coordinating roles.

Other central state government information entities include state libraries, state archives and records management organizations. These three functions may be separated (about two thirds of the states), or together (one third of the states). In addition, state and public information needs have been supported by various statistical and research centers. Much demographic data are available through State Data Centers which operate under agreement with the U.S. Census Bureau. For example, state labor departments maintain employment data, and have Interagency State Occupational Coordinating Committees to increase awareness and use of such data.

3. GI/GIS Institutionalization in State Governments

While governments have been institutionalizing centralized approaches to information and IT, some agencies increasingly employ geographic information and related technologies (GI/GIS) to help accomplish their missions and programs. While other IT was initially used to automate administrative functions, early GI/GIS applications were initiated as "bottom up" innovations to directly support government missions.

GI/GIS use seems to be challenging traditional government processes and approaches to information and IT in several respects. GI/GIS use can uniquely reveal redundancies, discrepancies and potential conflicts in the data of different agencies, but also in agency directives and programs. Moreover, there is anecdotal evidence that GI/GIS can promote clarification, collaboration, and resolution of differences to solve common problems. Because "everything in government is one way or another tied to the earth," geographically referenced data can be a powerful linking mechanism between data and organizations (King and Kraemer 1992, 9). Data requirements to maximize GI/GIS capabilities encourage coordination among agencies, governments and others. GI/GIS is also identifying issues not yet experienced regarding other information and IT, such as some legal and economic issues. This is revealed by specific provisions in otherwise general open records acts.

GI/GIS is increasingly used by virtually every sector of society, and has been applied to essentially all functions of government. However, knowledge of how GI/GIS is used by different governments is quite limited, and especially their internal institutional conditions. The most recent federal inventory indicated that over 40 federal agencies use GIS software (Federal interagency Coordinating Committee on Digital Cartography, 1990). A previous inventory of GI/GIS in states found that each of the 50 states has some GI/GIS activity (Warnecke et.al. 1992). No such inventories of local government GI/GIS have been taken, although some states have surveyed their localities.

While benefits have been realized by government use of GI/GIS, "institutional impediments" have caused results to be less than projected or possible. However, limited investigation has been conducted about institutional conditions and factors, and the impact of GI/GIS on organizations, government and intergovernmental relations. Moyer and Niemann conclude that institutional factors are "one of the least understood, least discussed, and most important aspects" of GI/GIS (1994, 17-23).

Several factors have been used by researchers to measure and evaluate institutionalization. While there is limited knowledge about institutional GI/GIS conditions, some information is available about state governments as reviewed below.

3.1 Scope and Use of GI/GIS

It seems that as GI/GIS organizations evolve, their conceptualization and use expands in that they use more data, technologies, applications and participants. In many organizations, initial focus seems limited to GIS software. However, attention to data seems to be growing as GI/GIS use expands. Recent technological improvements in the global positioning system (GPS) and remote sensing also expand focus to additional sources of accurate data. Institutionalized approaches to GI/GIS in states and other organizations seem to increasingly incorporate a broadened focus on GI/GIS, as seen by adopted state plans, policies, standards and other activities.

While most traditional GI/GIS use has been for environmental, natural resources and infrastructure applications, there is increasing evidence of its use in virtually all governing areas, including human services, public safety, government regulation and economic development. Representatives of these agencies increasingly participate in state GI/GIS groups and decision making. Consideration of these applications is further expanding data considerations and requirements.

3.2 Scope of "State" Approach

A broad view of GI/GIS is emerging in state governments. For example, while state GI/GIS efforts concentrate on executive branch agencies, the legislative branch is increasingly involved. Interbranch GI/GIS coordination has been established in some states.

A significant conceptual shift is that the definition of "state," in the context of GI/GIS, is the geographic area of a state, not merely the state government with its agencies and programs. Thus, states seem to be defined as a community or collection of interests having a broader identity and involving more governing actors than state government. Accordingly, other sectors, such as localities, federal agencies, Native Americans, the private sector and non- governmental organizations increasingly participate in state GI/GIS groups and decision making (Warnecke 1993). This trend is in contrast to the Federal Geographic Data Committee which only has federal members. This broader definition of "state" has important implications, since the needs and perspective of external organizations are increasingly reflected in overall direction and funding, in addition to data policies, architectures, requirements and custodianship.

3.3 State GI/GIS Authorization, Direction and Accountability

State GI/GIS is increasingly impacted and directed by Governors, Legislators, department directors and other state leaders. GI/GIS is also increasingly linked to important statewide, agency and program missions which can ensure its continued use and financing, as reflected by legislative action.

A comprehensive inventory of state GI/GIS authorizations was funded by the Mapping Science Committee of the National Research Council in 1993. It identified 100 state directives among the 50 states including (1) legislative actions such as statutes or resolutions, (2) executive actions such as executive orders or less formal directives, and (3) memoranda of understanding (MOU) which mention or directly influence GI/GIS. Marking accelerating growth, 49 of these directives were authorized from 1991 to 1993 (Warnecke 1993). State statutory references can be classified as follows:

- Authorizing GI/GIS coordination groups or studies (17),
- Authorizing statewide or broad environmental GI/GIS offices, databases or funding (14),

- Directing GI/GIS use or data development for specific missions or needs, mainly natural resources management, environmental protection or growth management (11),
- Providing for access and cost recovery for "GI/GIS data," often modifying open records laws which directly impact localities (10),
- Providing assistance to local and regional organizations,
- Authorizing GI/GIS for legislative reapportionment,
- Requiring compatibility of state funded data, or
- Directing the private sector to develop compatible data (New Jersey).

While the number of statutory GI/GIS references is increasing, few omnibus statutes exist specifically for GI/GIS, few fund offices, and few require commonality or authorize oversight. In addition to these legislative actions, fifteen state executive orders or related directives and five MOU were documented which mention or directly influence GI/GIS, though two of the orders are now void (Warnecke 1993).

In addition to authorizations, states are establishing GI/GIS direction through plans, policies, standards and guidelines. Clearinghouses, metadata, and other mechanisms are developing to manage and provide access to data. However, few states have established programs, incentives, procedures, resources or oversight mechanisms to ensure coordination or compatibility. Management monitoring, control and accountability mechanisms are just beginning to emerge, both at statewide and agency levels. Most efforts encourage coordination, however states with more experience seem to empower designated state entities with some authority.

3.4 Financial and Personnel Resources for GI/GIS

Financial and personnel resource allocations are frequently used to measure government action (Jenks and Wright 1993); however, their use for measuring GI/GIS activities are difficult for various reasons. First, different definitions and lack of internal measures and procedures impede quantification and comparison of GI/GIS resource commitments. No comprehensive inventories have been conducted of resource commitments in states or other governments, however, it is generally agreed that the allocation and use of resources is increasing.

Measurement of financial commitments is difficult, because most GI/GIS activities are funded as part of program missions, with each agency differing in how GI/GIS costs are categorized. In addition, uniform approaches do not exist to measure financial approaches in state GIS service bureaus. However, a few states have appropriated general fund resources for data, clearinghouses or coordinating staffs that can be measured.

Staff which use GI/GIS are often classified according to their agency, and common definitions do not exist concerning GI/GIS "work". Some states have a statewide classification series for GI/GIS that is separate from other information technologies. However, in most states, GI/GIS staff are classified under professional series related to the function of the agency they serve. For example, they may be classified as engineers in transportation departments, and resource analysts in natural resources departments. Some employees may not use GI/GIS directly, but coordinate, direct or support its use. In addition, some GI/GIS activities are supported by time donated by staff with other responsibilities.

3.5 State GI/GIS Coordination Groups

Compared to other areas of state GI/GIS institutionalization, a great deal is known about coordination groups. Essentially all of the 50 states has at least one interorganizational group whose primary propose is to improve the coordination of GI/GIS among state agencies. The increasing number and strength of these groups may serve as a "first step" to GI/GIS institutionalization. For example, groups frequently build momentum and demand for data, services and specific coordination mechanisms that often require established offices, staffing and funding.

Information about GI/GIS coordination groups in the 50 states is available from an initial description of each group, including their history, focus, membership and activities (Warnecke et. al. 1992). These findings were analyzed according to a proposed classification of groups (Warnecke 1992). An updated and synthesized inventory of state GI/GIS groups was conducted in 1993, with specific focus on identifying the sectors and functions represented in the membership of these groups (Warnecke 1993).

Currently, 85 to 90 state GI/GIS groups exist in the 50 states. Most are called "GIS" or "GI" councils or committees. These groups have different authorization, direction, resources, and participation, but they often have similar objectives. All have some degree of success. New formal and informal groups continue to emerge in the states. The trend is toward multiple groups that work together, with a policy level group having direction over one or more technical groups focused on GIS, GPS, base mapping, standards or other issues (Warnecke 1993).

Nine states have State Mapping Advisory Committees (SMACs), whose formation were encouraged by the U.S. Geological Survey (USGS) beginning in the late 1950's. These groups were generally formed to determine state mapping priorities, and provide input to USGS. Currently, only the SMACs in Nevada, New Jersey and Oregon have a broad focus and exist without other, more influential GI/GIS groups. Most states now have SMAC functions under broader, higher level groups.

There is a wide diversity in the level of policy or technical issues addressed by groups in different states (Warnecke 1993). State GI/GIS groups increasingly have formal and informal influence over the direction of GI/GIS in their states, although their authorization varies. There is a trend toward formalization of the roles of these groups, reflecting increased maturation and institutionalization. For example, over 40 States have at least one group with some degree of official stature, via statute (11), executive order (13), memoranda of understanding (2) or some other method (Warnecke 1993).

Group participants can include representatives of virtually all state government functions, and sometimes includes elected legislators or legislative staff. The organizational level of the individual participants in the groups varies considerably, ranging from agency directors to primarily GIS users. Some states differentiate between voting and non-voting membership categories, with perhaps only state members as voting members. Other state groups are more informal and virtually anyone is able to participate equally.

Other sectors are increasingly represented in GI/GIS groups, including localities, federal agencies, regional organizations, academic institutions, Indian tribal governments, utilities, non governmental organizations and the business community. Localities seem to be one of the fastest growing sectors represented in GI/GIS groups, since they can be directly impacted by state GI/GIS activities. Federal agencies participate in some state GI/GIS groups, however some states have difficulty determining which federal organization can represent all federal agencies.

4. Report Scope and Caveats

While other features of GI/GIS institutionalization can be analyzed as discussed above, this report (1) identifies GI/GIS users in the executive branch of state governments at one point in time, and (2) determines the incidence, authorization and administrative location of state GI/GIS coordination organizations or individual coordinators (hereafter referred to as "coordinators") over a ten year period of time. This information is supplemented with contact information for at least one GI/GIS coordinator or other official in each of the 50 states.

This report comprehensively and consistently identifies and diagrams organizations using or coordinating GI/GIS in the executive branches of the 50 states. With the 50 state organizational charts, and summary tables and graphs, this report serves as an up-to-date "window" of individual states, as well as an analysis of GI/GIS institutional conditions across all the states over time. The report includes some illustriative examples of organizational conditions in some states. Information could also be provided about other states, however space concerns limited the number of examples in the report.

In considering GI/GIS evolution and institutionalization, the existence of a discrete, identifiable entity, or coordinator is important for several reasons. It means that in some degree a particular activity has been authorized and institutionalized, with an entity having a jurisdictional role and domain. Existence of a coordinator with assigned responsibility indicates that "some combination of legal, political, fiscal and organizational actions have produced an administrative result," including allocation of financial and human resources (Jenks and Wright 1993, 79). As compared to other measures of institutionalization, the incidence, authorization and administrative location of GI/GIS coordinators were selected because these conditions can be definitively and consistently determined for individual states at specific points in time. Identification of GI/GIS users is also important concerning GI/GIS evolution and institutionalization, since this can indicate the degree to which GI/GIS is used in multiple governing functions. Future work can conduct similar tabulations and analyses to identify changes and trends.

This report specifically provides information about current and changing institutional GI/GIS conditions in the 50 states. This information is portrayed in organizational charts, and is summarized in tables and figures. It is not within the scope of the report to evaluate these conditions or entities, or their origin, connectivity or impacts. In addition, this approach means that only established organizations, and formal divisions of authority and work are provided. More informal organizations and networking are also known to conduct GI/GIS coordination.

4.1 GIS Users

The report specifically identifies GIS users in the executive branches of each of the 50 state governments, as of July 1, 1994. These users are displayed on organizational charts. Only users of GIS software are included because many additional agencies use GI. Definitional differences regarding "GIS" influenced development of the charts. For example, some agencies use computer aided drafting (CAD) or related software for some GI/GIS applications, such as departments of transportation (DOTs) and state park management offices. All 50 DOTs use CAD software for various applications and are considered in this project as GIS users.

Several efforts and queries were made to include all possible GIS users, however it is possible some may not be shown. For example, numerous state government organizational charts and directories do not include all state entities, particularly those for specific geographic areas smaller than the entire state. It is also necessary to rely on state officials for current information about other agencies. Not all GIS users are known by others in their state. Some users with small GIS installations may not be included due to space limitations, especially as an increasing number of state entities have personal computers with mapping software. When in doubt about size, and with space available, all organizations were included, particularly if they have some unique GIS applications.

4.2 GI/GIS Coordinators

The report also indicates the incidence of one or more statewide GI/GIS coordination entities or individual coordinators (hereafter referred to as a "coordinator") existing in each of the 50 states between December 31, 1985 and July 1, 1995. In addition, information is provided concerning whether the coordinators are authorized or unauthorized, and their administrative location.

GI/GIS coordinators at the statewide and department-wide level are displayed on the organizational charts by boxes with a bold line. If statewide GI/GIS coordination roles are shared by more than one entity, both are shown in bold, with a brief explanation in each box. While GIS users on the organizational charts are effective as of July 1, 1994, efforts have been made to reveal the incidence, authorization and administrative location of statewide GI/GIS coordinators as of July 1, 1995. Multiple efforts were made to assure accuracy in the identification of statewide GI/GIS coordinators. However, some department-wide coordinators may not be shown due to limited space and unavailable information. Others may be unknown to statewide GI/GIS coordinators.

Specific criteria are used to determine the incidence of statewide GI/GIS coordinators. All coordinators regularly conduct GI/GIS coordination activities among multiple agencies, however they differ in terms of authority, size, resources, responsibilities and type and level of efforts and activities. For example, a coordinator can range from multiple staff in a dedicated organizational unit, to the part time efforts of a single employee.

Attempts were made to show all entities in each state with statewide GI/GIS coordination roles by using a broad definition of GI/GIS. However, it was necessary to limit display to those with GIS coordination roles and activities because of limited space in the charts and terminological inconsistencies. In addition, as GI/GIS interest increases, many state leaders can influence GI/GIS policy and implementation, such as legislative committees and staffs, gubernatorial policy advisors, and interagency groups with broad roles such as for land use planning, economic development, and growth management. Of these organizations, only those in the executive branch with specific GI/GIS coordination roles are included in the charts. In addition to these coordinators, at least one general statewide information policy or technology entity is included for each state, whether or not that organization has an official GI/GIS role. These entities are included because they direct or implement information policies and technologies that increasingly influence GI/GIS coordination.

The organizational charts also show the administrative location of statewide GI/GIS coordinators as of July 1, 1995. An organizational typology was developed to differentiate, summarize and analyze changes in administrative locations over time. Previous research was used to develop the typology and classify states according to conditions at four additional points in time between 1985 and 1994. These classifications and trends are summarized in the tables and figures, and discussed in the findings.

While not indicated on the charts, this report's tables and figures identify statewide GI/GIS coordinators which are authorized and unauthorized, and changes in authorization between 1985 and 1995. Coordinators are considered authorized if some state sanction has been given for their existence, whether by legislative or executive action. Unauthorized state coordinators may have similar roles and activities; however, they only have the support of departmental, rather than state leaders to conduct statewide coordination work.

4.3 Organizational Chart Design and Characteristics

Most of the prepared organizational charts display administrative conditions as of July 1, 1994. Based on review of conditions across states, these charts can be considered as accurate one year later for statewide GI/GIS coordinators. July 1 was chosen as the effective date since this is when most state organizational changes become effective because it begins most state fiscal years. While a survey of all 50 states was not conducted, efforts were made to provide current and accurate information concerning the existence, authorization and administrative location of statewide GI/GIS coordinators. Accordingly, some more recent information was obtained and modifications were made to 13 charts to reflect recent changes and known departmental reorganizations that significantly impact GI/GIS conditions. Some organizational changes and additional GI/GIS users may exist in the other 37 states, and the charts may not be current for 1995 in this respect. However, the author is reasonably confident that the incidence, authorization and administrative location of state GI/GIS coordinators is current as of August, 1995.

Depicting relationships between elected officials, boards, commissions, departments and agencies was difficult in some cases. For example, some organizations such as departments of transportation (DOTs) are governed by commissions or other groups that are selected by or composed of other officials. These bodies may have an indirect relationship with governors because their terms may not coincide, and thus their connection is portrayed by a dotted rather than a solid line. In some cases, limited space prevented inclusion of these groups.

With the overall goal of providing clear and consistent charts, some additional efforts were needed to minimize the number of boxes and words on each chart. In some cases, a box or two in a "chain of command" or suborganizations with general administrative, legal and enforcement roles are not included. Many entities with sub-state or interstate roles are not included, unless they are large or unique GI/GIS applications, or specific requests were made to included them. The names of states were eliminated from organizational titles to save space. In addition, the sequence of words used in titles were altered to provide the functional name first, such as "natural resources", then followed by the administrative unit such as "department", thus eliminating the space needed for repeated use of the word "of". Abbreviations are used when necessary, but appropriate care was taken to avoid confusion.

Some other state organizations with GI roles were not included on the charts. This was due to space limitations and consistency requirements across states, as well as the difficulty in identifying some state entities with related responsibilities. For example, some states have organizations with important traditional roles regarding land recordation and referencing of all lands, while localities have these responsibilities in other states. Some states are responsible for maintaining local government boundaries and have local boundary commissions to review decisions and resolve disputes. Over half the states have a geographic names authority to help determine the names of physical features. State geodetic advisors are located in about half the states to provide advice regarding use of GPS.

5. Methodology

This report provides information from two projects, and is supplemented by more recent information for some states. The first project which devised and analyzed the 50 organizational charts, was conducted simultaneously with another project which involved preparation of organizational charts for identification of entities with environmental and natural resources (ENR) roles and activities in state governments (Warnecke 1994). The second project was research and analysis conducted by the author for her doctoral dissertation, and analyzed state GI/GIS institutionalization over a ten year period. This material is supplemented by contact information for at least one GI/GIS coordinator or related official in each of the 50 states. Work was conducted using several sources and concurrent phases as described below.

Phase One: Synthesis of Available Data

Work began in late 1992 with gathering material on government organizational structures and GI/GIS institutionalization in the 50 states. These materials were compiled with documents, notes and other written materials from the author's past inventories and surveys of officials in the states. This information was complemented by lists and publications of various state associations, federal agencies and other sources. These materials were synthesized, forming a knowledge base concerning the identity, roles and responsibilities of various agencies, departments and offices in each state.

Phase Two: Data Collection

Existing materials were updated and supplemented by original data gathered from one or more officials in each state. This effort began in May, 1993 as a supplement to a short questionnaire used by the author for a related survey conducted for the Mapping Sciences Committee of the National Research Council. Collection of relevant organizational charts was determined to be the best approach to understand relationships, and determine GI/GIS users and coordinators. One or more state officials in each state were asked to send current statewide and departmental organizational charts, and to identify the administrative location of all executive branch entities with GI/GIS roles and activities on the charts. In total, at least two organizational charts were collected from each state. Some state officials also sent telephone directories to supplement the charts.

Telephone contact was made with each official to interpret materials they provided and to ensure that all appropriate organizations were included. Additional copies of the questionnaire were sent to some officials, and other charts were also gathered and analyzed. Materials were compared with other information for individual states for verification. All discrepancies were reconciled with additional contact and data collection. This phase of data collection was completed in January, 1994. A few additional charts and materials were gathered later for states which had undergone organizational changes.

Phase Three: Preparation and Verification of State Organizational Charts

This phase included a thorough exploration and evaluation of the organizational charts provided by states, supplementary external information about agencies, and other relevant material about institutional GI/GIS conditions in the 50 states. This effort was needed to ensure the completeness of the data, and to make necessary judgements for the design of the GI/GIS organizational charts.

A GI/GIS chart was designed and schematically illustrated for each state executive branch. These charts revealed all GI/GIS users, authorized and unauthorized state GI/GIS coordinators, and at least one general statewide information policy or information technology (IT) organization for each state, whether or not that organization has official GI/GIS roles. Display of this information on organizational charts facilitates comparison of the incidence of GI/GIS coordinators across states, as well as their administrative locations, hierarchies, and relationships. An associate prepared the charts in automated form using OrgPlus for Macintosh, Version 1.00.

The automated versions of the charts were submitted to state officials for verification between February and April, 1994. At least one official per state provided comments and verified the accuracy of the charts, with corrections incorporated in final versions. All known 1994 legislative actions impacting the charts were incorporated, with final changes completed in June, 1994.

Between June, 1994 and July, 1995, efforts were made to keep informed of any changes in the states concerning general organizational conditions and the incidence, authorization and administrative location of statewide GI/GIS coordinators. While a survey of all 50 states was not conducted, as in 1994, states with known changes were contacted in August and asked to provide updated information. Subsequent modifications were made to produce new state charts to reflect changes in 13 states. Accordingly, these 13 state charts have a "1995" notation at the bottom, while the others have "1994" on them.

Phase Four: Classification of State Data

Information on the charts was classified for GI/GIS users and coordinators. GIS users in the 50 states were categorized according to a list of state government functions that was developed by the author. An organizational typology of administrative locations of GI/GIS coordinators was developed as described in the next section. An important component of this work is investigation of changes over the last ten years in the incidence, authorization, and administrative location of state GI/GIS coordinators. Accordingly, the organizational typology was designed to be applicable for this entire period.

Previous research by this author has investigated institutional conditions since GI/GIS use began in the 50 states (Warnecke et.al. 1992). Data collected since 1985, but not previously classified, was used to systematically categorize and code each state as of the end of 1985, 1988 and 1991. In some cases, additional information was gathered and queries were made of state officials to verify classifications. Information on the charts were supplemented so that conditions at the end of 1994 were depicted. Data accurate at the end of these four years (1985, 1988, 1991, and 1994), and changes between January and August, 1995, are reflected in the report's tables and figures.

Phase Five: Analysis and Conclusions

Data were compiled and examined concerning state government GI/GIS uses, and the incidence, authorization, and administrative location of statewide GI/GIS coordinators.

These data were summarized and are provided in the report's tables and figures. Data were examined independently, and also in the context of general state organizational conditions. Complemented with related research and personal experience, this analysis was used to define trends, and provide conclusions, implications and insight about future conditions.

6. Findings and Analysis

This work was conducted to provide state officials and others with information about the institutionalization and use of GI/GIS in the 50 states. An original organizational chart was designed and prepared for each state government which can be used in many different ways. As summarized below, these charts, summary tables and graphs, (1) identify GIS users in the executive branch of state governments at a single point in time, and (2) reveal the incidence, authorization and administrative location of state GI/GIS coordination organizations or individual coordinators (hereafter referred to as "coordinators") over a ten year period.

6.1 GIS Users in State Executive Branches

Among all governments, it is generally agreed that most GIS use has been for environmental, natural resources, transportation and utility functions. More recently, this and other research indicate GIS use by virtually all functions of government. While knowledge about applications is limited for federal and local governments, information has been compiled about applications in states. For example, as of 1990, each state government had at least one GIS application (Warnecke et.al. 1992). While an extensive index of these applications was prepared, this work did not categorize them according to government functions.

This report, however, includes categorization and tabulation of the GIS users on the charts. This provides information concerning the extent to which states use GIS for multiple government functions. Various governments, associations and researchers have developed useful categorizations of state and other government functions. These schemes were considered to prepare the classification system used in this and previous reports of this author. The resulting comprehensive list of government functions provided below can also serve as a useful checklist in evaluating present and potential GI/GIS users and participants in cooperative efforts.

Tables 1 and 2 provide data about state GIS uses categorized according to these government functions, as of early 1994. These results were prepared by classifying each of the agencies identified in the 50 organizational charts according to this scheme. The frequency of GIS use in states is summarized below according to the following categories, followed by the number of states in each category.

- Environment/Natural Resources Management and Protection (50)
- Infrastructure - Transportation (50)
- Public Safety and Emergency Management (24)
- Economic Development (20)
- Community and Local Affairs (20)
- General Government Functions: Planning, Administration, Finance, and Asset Management (19)
- Cultural Resources (19)
- Human, Social or Educational Services (13)
- Planning and Growth Management (12)

Some observations and conclusions can be drawn from this information, even though it was collected at one point in time. Informal comparison of these findings with those in 1990 (Warnecke et.al. 1992) reveals continuing growth in GIS activity in environmental and natural resources (ENR) management or protection, and transportation applications. Interestingly, GIS is particularly strong in ENR areas in which states have greater jurisdiction than the federal government, such as water (49), wildlife (42), geology (39), waste management (30), air quality (29), forestry (27) and agriculture (27).

Substantial GIS growth is indicated for "emerging application areas" in governing functions such as public safety, emergency management, economic development, general government, cultural resources management and human or social services. These functions are among those with the greatest political and financial support from government decision makers. GIS use in many of these areas has encouraged integration of otherwise disparate data such as for natural resources, infrastructure, demographic and human services. Such GIS use can facilitate data quality and commonality across government functions, increase multiple use of data, and educate policy makers about GIS usefulness. All of this can increase GI/GIS resources.

These findings also indicate that GI/GIS use is expanding from individual programs within an agency to multiple program areas and central and support units. At the same time, there is a growing trend toward more functional integration in state governments, as described above. Accordingly, there seems to be some institutional evidence that GIS is becoming an information management, analysis and planning tool across programs and for entire functions and agencies in addition to program applications. This trend is particularly evidenced in ENR, but may extend to other functions. Opportunities could exist to use GI/GIS to help integrate approaches to utilities and other infrastructure as needed in right-of-ways, as well as among various human services delivery programs. GIS use may be reinforcing functional integration trends.

6.2 Statewide GI/GIS Coordinators

This report provides evidence of continuing growth in institutionalization of statewide and department level GI/GIS coordination, specifically investigating organizations and individuals with these responsibilities, known collectively as "GI/GIS coordinators." Data were collected and examined for three factors concerning state GI/GIS coordinators, including their incidence, authorization, and administrative location. Tables 3, 4 and 5, and Figures 1, 2A, 2B and 2C summarize the findings of this research over the past 10 years in the 50 states. Findings reported and analyzed in this chapter focus on recent conditions and changes.

6.3 Incidence of State GI/GIS Coordinators

Existence of a state GI/GIS coordinator or focal point can be a key component of GI/GIS institutionalization and coordination. Three specific criteria were used to determine the incidence of a state GI/GIS coordinator, including (1) the regular and repeated practice of some GI/GIS coordination concerning multiple agencies, (2) efforts conducted by a single or multiple state employee(s) in a definable organizational location, and (3) the common recognition by others that this entity is the state's GI/GIS coordination focal point. Determinations from the organizational charts was complemented by historical data previously collected, but not previously classified by this author (Warnecke et. al. 1992).

The results indicate an increase of state GI/GIS coordinators over time. As of mid 1995, 41 of 50 states have at least one state GI/GIS coordinator. As revealed in Table 3, nine of these 41 states have GI/GIS coordination responsibilities shared by two organizations. Analysis of changes in these conditions over time reveals that 40 states had coordinators in 1991 and 1994, however, two states established a coordinator, and two states ceased this activity during this period. While the number of coordinators has only increased slightly since 1991, more dramatic changes occurred before 1991, as summarized in Tables 4 and 5. Only seventeen states had coordinators in 1985, and 29 states had them in 1988. Accordingly, the incidence of coordinators more than doubled, from 17 to 40, in the six year period between 1985 and 1991.

These findings indicate an important trend toward the establishment of GI/GIS coordinators in states. Their growth provides evidence of increasing institutionalization of GI/GIS coordination in the states, and overall institutional development concerning GI/GIS. Nine states still lack a GI/GIS coordinator as of 1995. While it is difficult to extrapolate these past conditions to make future projections, it can be expected that these states probably have some version of a state GI/GIS coordinator within the next few years.

6.4 Authorization of State GI/GIS Coordinators

Authorization is the second factor considered in this research about GI/GIS coordinators and institutionalization in states. If a state GI/GIS coordinator exists, it is considered either official and "authorized," or more informal and "unauthorized." Authorized coordinators include those with statewide sanction, including (1) legislative action, such as a statute or resolution, or (2) executive action, usually an executive order, or sometimes a governor's letter, memo or other directive. Coordinators that do not have one of these forms of authorization are considered "unauthorized."

Table 1 reveals the authorization of state GI/GIS coordinators in each of the 50 states at the end of four different years, and most recently as of the middle of 1995. Summarized results concerning authorization are presented in Table 4 and Figures 1, 2B and 2C. These results indicate that 33 of the 41 state coordinators in 1995 are authorized. The number of states with authorized coordinators more than tripled between 1985 and 1994, from 10 to 31. In addition, Table 4 reveals that the percentage of authorized, as compared to total coordinators, increased from a low of 52% in 1988 to 80.5% in 1995.

While overall findings show an increase in the incidence of state GI/GIS coordinators, specific attention to authorization indicates an even greater growth in the number and frequency of authorized coordinators. These results reveal a trend toward increasing authorization of state GI/GIS coordinators that is even stronger over time than the increase in their incidence. Increasing authorizations indicates strengthen institutionalization of coordination and overall institutional development concerning GI/GIS. Although creation of new GI/GIS coordinators has slowed since 1991, it seems the number of authorized ones will continue to grow. Accordingly it is anticipated the eight states with unauthorized coordinators, and the nine states without coordinators will have authorized ones within the next few years.

6.5 Roles and Activities of State GI/GIS Coordinators

While knowledge of whether a GI/GIS coordinator is authorized or unauthorized is significant when analyzing the institutionalization of GI/GIS, it is also important to consider that this is only one of many factors that determine the roles and activities of a GI/GIS coordinator. As described in Chapter 4, a state GI/GIS coordinator can be a portion of one employee's time, or multiple staff. Roles, responsibilities, resources, level of effort, and effectiveness can vary significantly, and are often independent of authorization. For example, some GI/GIS coordinators concentrate on coordinative roles, while others are primarily operational as service centers. The following roles and activities are known to be underway by one or more state GI/GIS coordinators:

- Serve as a clearinghouse concerning activities, projects and plans about GI/GIS in state agencies and possibly other entities, including providing directories, guides, annual reports, newsletters and other materials with current information.
- Provide data clearinghouse, access and dissemination functions for data indexed and possibly maintained in a state GI/GIS database, and perhaps providing customized data searches, manipulation and interpretation to meet user needs.
- Develop and implement data and metadata policies, guidelines, standards and procedures to encourage data commonality and sharing, including accuracy and scale requirements to meet overall state needs.
- Promote collaborative planning for future data development and other work, including helping prioritize and coordinate data work conducted by multiple organizations.
- Develop data, sometimes with general appropriation or collaborative interagency funding to ensure data is useful for more than one purpose, project or agency.
- Provide contract GIS services for state agencies and others.
- Staff GI/GIS coordination and user groups.
- Hold GI/GIS conferences and meetings to facilitate information exchange.
- Provide GIS educational services for state agencies and others.

6.6 Administrative Location of State GI/GIS Coordinators

The third and most extensive factor analyzed in this research is the administrative location of state GI/GIS coordinators. An original organizational typology was prepared to classify the administrative locations of present and past state GI/GIS coordinators. This approach may also apply to investigation of GI/GIS coordinators in other governments. Classification of the statewide coordinators identified on the organizational charts for each state was supplemented by analysis of historical information conducted in past research (Warnecke et.al. 1992).

Table 3 displays the administrative locations of each of the 50 states for five points in time between 1985 and 1995. These results are summarized in Table 5, and Figures 2A, 2B, and 2C. In the states with two state GI/GIS coordinators, the leading one is listed first on Table 3, and its administrative location is used to classify that state in Table 5, the figures, and the analysis.

The organizational typology includes five distinct administrative locations in which state GI/GIS coordinators may reside. The first two categories, Planning, Policy or Administration (PPA), and Information or Information Technology (IIT), represent central agencies with a statewide focus which have roles in most or all state agencies. In the states where PPA and IIT agencies are in the same organization, judgement was used to determine which of the two has the most direct relationship to the coordinator. The third category, Environment and Natural Resources (ENR), includes various comprehensive or other agencies whose mission includes one or more ENR functions. While these categories include most state GI/GIS coordinators, some entities are located in other state government agencies (State) than those described above, or outside state government itself (Non).

As shown in Table 5 and Figure 2A, most state GI/GIS coordinators are located in one of the first three types of state agencies, enumerated above. Over time, the number of coordinators in IIT agencies has grown more than the other two categories. It increased from zero to 18 between 1985 and 1995, with the most dramatic growth between 1988 and 1991. The number of coordinators located in PPA agencies has also grown, from four to 10 in 1994, but dropped down to eight in 1995. Alternatively, the number of coordinators in ENR agencies was the highest in 1985 with 11, increased to 14 in 1988 and 1991, and then declined to 12 in 1994.

With 18 coordinators in IIT agencies, and eight in PPA agencies, it is significant that 26 states have one or more coordinators located in a central government agency. Moreover, 22 of these coordinators are authorized, compared to only four that are unauthorized. Location of these entities in agencies with statewide focus provides additional evidence of increasing institutionalization of GI/GIS coordination in the states, and particularly, overall institutional development concerning GI/GIS. Though the growth in the establishment of GI/GIS coordinators has slowed since 1991, it is conceivable that some existing coordinators will move to one of these central agencies and new coordinators will be similarly located.

The administrative location of state GI/GIS coordinators is also significant when compared to other governments. Information and research is limited about related institutional conditions in local governments. However, at the federal level, the staff of the Federal Geographic Data Committee (FGDC) are analogous to state GI/GIS coordinators. Since initiation, FGDC staffing has been administratively located in the National Mapping Division of the Department of Interior's (DOI) Geological Survey. This location is similar to the ENR category in which only 12 of the 41 state coordinators are classified in 1995. Accordingly, states seem to be more institutionally developed than the federal government regarding administrative location, while they are at somewhat similar levels concerning the incidence and authorization of GI/GIS coordinators.

Each of the five possible administrative locations for state GI/GIS coordinators are reviewed below, including some examples and discussion of the findings, trends, advantages, and disadvantages of the locations.

6.6.1 Information Policy or Information Technology (IIT)

As indicated above, the results show that IIT agencies are experiencing the greatest increase of any administrative location for state GI/GIS coordinators, increasing from none to 18 in the ten year period since 1985.

Each state executive branch has one or more central agencies responsible for statewide information policy or IT activities in at least all agencies under the jurisdiction of the governor. The responsibilities of these coordinators generally include information policy, planning, standardization, and oversight of the activities of state agencies. They may provide various technology services to agencies, including mainframe computing, telecommunications or other technologies. Each state has at least one agency with some combination of these roles. Some states have the policy and oversight roles in a separate organization than service functions. These organizations are distinguished from more traditional central information entities, such as libraries, records management and archives offices and agencies, and other state statistical offices that exist for specific types of data such as socioeconomic or natural resources.

The characteristics of IIT agencies vary by state. Funding of their roles and activities is of particular importance and has implications regarding GI/GIS institutionalization. Similar to GI/GIS services provided by some state GI/GIS coordinators, IT service functions are usually funded by reimbursements from other state agencies for computing, telecommunications, consulting, technical or other services. General appropriations usually do not subsidize them. Many states have generated surpluses with these charges. Some states use them to fund information policy and planning functions, while other states use general appropriation funding for information policy and planning.

These surpluses may also be used to support GI/GIS activities. While no state GI/GIS coordinators were located in IIT agencies in 1985, 18 are located in them in 1995. These agencies began to show some interest in GI/GIS in the late 1980's. IIT agencies in California, Kentucky and Ohio, were among the first to include GI/GIS coordination as one of their roles, and used surpluses from IT services to establish GI/GIS service centers. By 1991, 12 of these agencies had the leading role for GI/GIS coordination in their states. Two additional states shared coordination roles with this and another state agency. In some states, existing GI/GIS service centers or other coordinators were moved to information agencies, as in Maine, Oregon and Utah. Review of conditions in individual states are illustrative of experiences and changes that can occur in state GI/GIS organizations and their institutionalization, for example:

> Utah was one of the first states in the country to have an authorized state GI/GIS coordinator. Its Automated Geographic Reference Center (AGRC) was established in 1981 in the Department of Natural Resources, moved in 1986 to the Office of

Planning and Budget (OPB), and then moved in 1989 to the Division of Information Technology Services (ITS) in the Department of Administration. OPB has statewide policy and planning responsibilities for information and IT in general. The state's GI/GIS policy and coordination function was retained by OPB until 1993, and was then moved back with AGRC. Funding is provided by both service bureau fees from ITS and general appropriation for some data and metadata development. One of AGRC's early and continuing roles is to provide GI/GIS services for other agencies and, more recently, to manage the State Geographic Information Database (SGID). Although AGRC was authorized as a statewide GI/GIS organization at its inception, it received statutory authorization and was directed to have specific roles in 1991, These include maintenance of SGID and dissemination of its data.

Florida's statewide GI/GIS coordination efforts were initiated by one of the strongest state growth management acts in the nation, adopted in 1985. The Growth Management Data Network Coordinating Council was subsequently established, with members from multiple state agencies and staffing from the Governor's Office. Part of the staff's role was state GI/GIS coordination, focused on data networking and standards to facilitate sharing. Council staff were moved to the Information Resources Commission (IRC) in 1993, which is the organization responsible for statewide information policy and planning. Additional staff resources were designated for GI/GIS coordination at IRC, although Florida does not have a GI/GIS service center. Both IT and GI/GIS services are conducted by agencies other than IRC.

Location of a GI/GIS coordinator in an IIT organizations can have important advantages and disadvantages. An important advantage of being in any central agency is that it does not have a specific governing function, other than direction or service to all agencies, regardless of their mission. Another advantage is that funding might be available from an IT services center if its leaders support GIS activities. IT technical resources, expertise and other support can also be useful for technical networking, data sharing, and administrative support. If located in a general information office that is separate from an IT office, such as Utah's OPB, then other benefits might be realized. For example, a close relationship to politically strong offices and activities could make it easier to get funding for GI/GIS.

There are also disadvantages of having GI/GIS coordinators in these organizations. Many IT departments continue to operate as mainframe data processing centers, while trends are for these departments to become more oriented to providing services for smaller computers and networks. Some IT departments have bad reputations because they might resist new and smaller systems. Some IT organizations and personnel may not adequately understand the unique aspects of GI/GIS as compared to other information and IT. In particular, they may not understand the importance of a geographic perspective. For example, an important difficulty can be that IT organizations generally do not realize the importance of geographic data development and sharing, so they maintain focus on only state agencies rather than external organizations as well. However, GI/GIS essentially requires consideration and attention to data that can be usable and shared with other governments and sectors. Lack of confidence in IT organizations, and their decisions and service, could have negative impacts on GI/GIS coordination efforts if located together.

6.6.2 Planning, Policy, or Administration (PPA)

While most state GI/GIS coordinators are located in IIT agencies, the results indicate an increase in the number of GI/GIS coordinators located in PPA agencies until 1991. Ten states similarly had their coordinator located in a PPA agency in 1994, but two states relocated their coordinator to an IIT agency effective in 1995.

All states have central entities that provide administration of the executive branch, or agencies directly under the governor's jurisdiction. Each governor has an internal executive staff, often including key individuals for certain policy or functional areas. Some states have statewide policy and planning functions located with this executive staff. Other states have a separate central planning office, with focus and roles that often change with individual governors. Planning entities vary in size among the states. Some have just a few staff, while others have scores of individuals. All states also have some form of an administrative, central, or general services agency that is responsible for statewide functions such as purchasing, personnel, internal mail, accounting. Budget and related finance functions may be located in planning entities, administrative agencies, or may exist independently.

Some PPA agencies have been active in GI/GIS even before 1980. These central agencies can be more political and vulnerable to changes in governors and political conditions than information and IT organizations. A few well-established planning agencies have used GI/GIS for internal purposes and have served as authorized or unauthorized coordinators. For example, New Hampshire's Office of State Planning has been authorized to lead GI/GIS coordination since 1984 and has provided some funding to the University of New Hampshire to conduct GI/GIS services since then. Thus, the office and the university share coordination roles as indicated in Table 1. Rhode Island's Division of Planning and the University of Rhode Island are similarly authorized to share coordination roles. Other established planning agencies in Maryland and Minnesota began GI/GIS work in the 1970's. GI/GIS activities continue in these four agencies today. Many of New York's early GI/GIS activities occurred in the Governor's Office of Planning Coordination in the late 1960's, but the office was eliminated in the early 1970's. Related GI/GIS activities ended for various reasons.

In other states, more recent or strengthened planning, policy and administrative agencies have been authorized to have GI/GIS coordinators or larger service centers. For example, Kentucky's Office of Geographic Information was established in the Finance and Administration Cabinet by legislation of 1994. Wisconsin's Land Information Board staff are organizationally located in the Department of Administration (DOA) and conduct GI/GIS coordination, while DOA's Bureau of Information and Telecommunications Management is establishing a GI/GIS service center in 1995. Currently, the nation's two largest and among the oldest GI/GIS coordination organizations are located in state planning agencies. Each has over 25 staff as of 1994:

> North Carolina's Center for Geographic Information and Analysis (CGIA) has developed from being the state's unauthorized GI/GIS coordinator in 1977. As in Utah and other states, CGIA originated in an environmental and natural resources agency, the Department of Environment, Health and Natural Resources. It was officially authorized and moved to the Governor's Office of State Planning by

executive order in 1991. A previous study determined this location was appropriate since the Governor's Office has a statutory mandate for coordination of statistical data. CGIA has almost been completely funded by GI/GIS services provided to state, federal, and other agencies, although it also has an official GI/GIS coordination role.

Minnesota's Land Information Management Center (LMIC) operated in the State Planning Agency from 1977 until 1991. In 1991 it became officially authorized as the state GI/GIS coordination center and was moved to the state's central IT agency, the InterTechnologies Group (InterTech) in the Department of Administration (DOA). Unlike Utah and Florida, where information policy and IT services are organizationally separate, Minnesota's information policy organization, the Information Policy Office (IPO), is administratively located in DOA. IPO is funded by general appropriation, while InterTech is funded by service fees. LMIC reported to both entities, and was responsible to InterTech for GI/GIS services, and IPO for policies and standards. In 1993, LMIC was moved back to the State Planning Agency by executive order. LMIC has more state funding for data development and services than any other state GI/GIS organization in the country.

Perhaps the most significant aspect of locating GI/GIS coordinators in PPA agencies is political consequences, which can be advantageous or disadvantageous. This location can offer visibility, authority, dedicated resources, and flexibility. All these are needed to respond and maximize GI/GIS opportunities under changing circumstances. Many typical planning agency missions can be aided by GI/GIS and data from multiple agencies; thus, coordination roles can be closely related to agency activities.

However, there are disadvantages of this location. For example, PPA agencies sometimes lack technical resources and expertise to maximize data sharing, and GI/GIS development and networking. They can be politically vulnerable to budget-cutting, and the level of support and funding for GI/GIS can change dramatically, especially if other political priorities become more important or governors change.

6.6.3 Environment and Natural Resources

Over the last ten years, the number of state GI/GIS coordinators located in environment and natural resources (ENR) agencies has essentially remained stable, however their number declined between 1991 and 1994. Location within an ENR agency means that coordination activities are conducted within an agency responsible for a specific functional area of government. Alternatively, the trend is toward location of GI/GIS coordinators in the above two categories which represent the institutionalization of GI/GIS coordination within central agencies.

ENR agencies can report to the governor, or another elected official, board or commission. They can be responsible for one or many ENR functions, such as natural resources management, such as for water, forestry, geology, and public lands management. Alternatively, they may have environmental protection roles, analogous to the U.S. Environmental Protection Agency (EPA). The number, organization, roles, and activities of individual ENR agencies within a state vary across the country. This variation can have implications for GI/GIS. Recent research showed that ten states have a comprehensive or omnibus ENR agency, nine states have an ENR agency that is almost omnibus in scope, six states have two leading ENR agencies (generally with one for natural resources roles and the other mirroring EPA functions), eight states have two to four leading ENR agencies, and seventeen states have five or more agencies with ENR roles and activities (Warnecke 1994).

ENR agencies were the earliest locations of GI/GIS activities and coordination roles in the states, with some ENR agencies having the largest GI/GIS sites among the 50 states. For example, Washington's Department of Natural Resources began GI/GIS activities in 1955. This department now has one of the largest GI/GIS facilities of any state agency in the country. Until 1990, it served as the unofficial state GI/GIS coordinator. However, the Department of Information Services has served as the unofficial state coordinator since then.

GI/GIS activities in some state ENR agencies have evolved over time to become authorized or unauthorized state GI/GIS coordinators. Table 1 shows that 11 states had GI/GIS coordinators in ENR agencies by 1985, almost twice as many as in all other locations at that time. However in 1994, 12 state coordinators were located in ENR agencies, as compared to 28 in other locations. While some entities in ENR agencies are unauthorized, they can nevertheless provide important coordination functions. This is particularly true if their host ENR agency has multiple and comprehensive ENR roles. For example:

> New Jersey's Department of Environmental Protection (DEP) is a comprehensive ENR agency. It began an agency-wide approach to GI/GIS in the mid 1980's. DEP established a GI/GIS bureau in the Division of Science and Research in 1986, which was subsequently moved to DEP's central IT organization in 1993. It acts as an internal service bureau for DEP, providing digital data development and management, and GI/GIS services for the agency's divisions and others. DEP staff also chair and staff New Jersey's GI/GIS coordination group.
>
> The Massachusetts Executive Office of Environmental Affairs (EOEA) is one of the most comprehensive ENR entities in the 50 states. It began GI/GIS work using the facilities of the U.S. Geological Survey's Water Resources Division. In 1989, it acquired its own facilities to operate the cabinet-wide "MassGIS" within EOEA's Data Center. The data center also provides GI/GIS data coordination and IT services for EOEA's departments, although departments also have internal IT and GI/GIS facilities. MassGIS supports a GI/GIS committee for EOEA that reports to EOEA's Information Systems Steering Committee. EOEA staff have chaired the Massachusetts Geographic Information Committee. At the same time, staffing is provided by, and GI/GIS coordination roles are shared with the Office of Management Information Systems, Massachusetts' lead IIT agency.
>
> The Illinois Department of Energy and Natural Resources (ENR) had served in an unofficial capacity as the state GI/GIS coordinator since the early 1980's. It has some of the most extensive GI/GIS facilities of any state agency in the country. ENR had conducted multiple statewide coordination efforts in this capacity including provision of data on a CD ROM. In 1995, ENR was merged with the Departments of Conservation, and Mines and Minerals to form the new Department of Natural Resources, and the legislature established the Illinois Geographic Information

Council. It officially designated the new DNR as the lead agency for the council, thereby DNR became the official coordinator for the state. Alternatively, some ENR agencies were authorized in this capacity over ten years ago, such as Idaho's Water Resources Department in 1980, and Arizona's State Land Department in 1982. These two agencies continue to have these roles in their states.

Changes have been underway for state GI/GIS coordination entities located in ENR agencies. As indicated in Figures 2B and 2C for 1995, eight ENR agencies are authorized to house state GI/GIS coordination entities, and four have these roles unofficially. State GI/GIS coordination entities located in ENR organizations have some advantages which are not available with central government entities described above. For example, GI/GIS activities may be beneficial to the ENR agency for individual program missions or more general purposes, as well as state government collectively. This is particularly true if an ENR agency is comprehensive in focus and functionality, and needs integration of various data to meet overall agency goals. GI/GIS coordinators can benefit from important financial, expertise, and other support for data, technology and other resources from their host agency. Efforts to develop and coordinate ENR data, some of the most important data in GIS, can be enhanced as well. In some cases, unofficial GI/GIS coordination activities so strong, that demand for an authorized coordinator is minimized.

Location of state GI/GIS coordinators in ENR agencies also has some disadvantages. For example, GI/GIS coordinators may lack the visibility, stature, or authority to promote coordination, even if they are authorized. In addition, agency missions can conflict with statewide needs. Thus, there can be a perception that ENR agency needs may overshadow state requirements and priorities. Representatives in agencies with missions other that ENR functions may feel that their needs are not considered as important as ENR agencies, or that GI/GIS expertise and quality control may be lacking for work conducted by service bureaus in ENR agencies.

6.6.4 Other State Agencies and Non-State Government Organizations

The vast majority of state GI/GIS coordinators exist in one of the above three administrative locations. The two remaining categories include locations that have been unique for certain states. It is difficult to determine if their existence is indicative of a trend or are simply isolated examples, based on the particular conditions in individual states.

In 1994, the fourth category for other state agencies, only included the states of Mississippi and Montana. In 1991 it also included Georgia and West Virginia. The Mississippi Automated Resource Information System (MARIS) has officially served as the GI/GIS coordination organization since its inception in 1983 in the Mississippi Institutions of Higher Learning. This is a coordinating department in the executive branch for academic activities. Montana's GI/GIS coordination organization is uniquely located in the State Library. Both Georgia's and West Virginia's past coordination function was located in their state community and local affairs agency.

The last category includes any administrative locations outside state government, including academic institutions. It also includes other coordinators not affiliated with state governments, such as other governments, or not-for-profit or private sector organizations. Only one state, Vermont, has its primary GI/GIS coordination organization in this category.

Vermont's official Center for Geographic Information is a not-for-profit corporation physically located at the University of Vermont. It is authorized at the highest state government levels, and governed by a Board of Directors composed of state agency and other officials. Three other states, New Hampshire, New Mexico, and Rhode Island, have their leading public university serving as the second of two state GI/GIS coordination entities.

The advantage of a university or other location may be that the organization has autonomy which gives it financial and other flexibility that would not be possible for a center located within the state government bureaucracy. This location also has disadvantages. For example, it can lack visibility and integration with other statewide endeavors. Financial problems might also be a constraint, as dedicated state funding may be hard to obtain and maintain.

6.7 External and State Government Factors Explain GI/GIS Institutionalization

These findings indicate that state governments increasingly establish, authorize, and locate state GI/GIS coordinators in central agencies. States are exhibiting an increasing level of development by institutionalizing approaches to improve coordination of GI/GIS activities. Various external and internal state government conditions and trends seem to influence the creation of state GI/GIS coordinators, as well as their authorization and administrative location.

Some of the external factors which impact GI/GIS institutionalization are described in Chapter 2 and summarized below. Several general societal and government trends seem to encourage GI/GIS institutionalization, such as the increasing importance of data and the need for better information in government. At the same time, many governments are modernizing, decentralizing, and reducing the size of their operations. Various government functions tend to be more coordinated and integrated, and additional organizations are having new and stronger roles in the nation's government.

Within the United States, federalism is considered to be of increasing importance to influence government changes, with more roles and responsibilities delegated to states and localities. At the same time, states exhibit leadership, initiative, and innovation in many respects, coupled with improved institutional capacity and coordination. These changes are sometimes reflected in government reorganization, though they can be difficult to approve and implement. Coordination mechanisms are particularly evidenced in certain integrating functions, such as planning, economic development, emergency management, and environmental and natural resources functions. In addition, these are reinforced through societal and overall government direction. Though fiscal limitations are increasing, these changing conditions and coordination trends in government seem to be stimulating GI/GIS growth and institutionalization.

At the same time, GI/GIS uses and activities are increasing, including for broader and new purposes, as well as expansion of earlier applications. Experiences in individual states suggest that government leaders, including elected officials, and central agency managers such as for PPA and IIt agencies, are expressing interest in GI/GIS. They also seem to recognize coordination needs, particularly if GI/GIS use reveals redundancies and inadequacies in data and programs. However, another significant factor is that traditional approaches to information and information technology (IT) do not necessarily acknowledge or provide for key differences and coordination needs regarding GI/GIS, as discussed in Chapter 3. This condition can act as an overall constraint to GI/GIS coordination.

While these factors may provide incentive for the establishment and authorization of state GI/GIS coordinators, additional factors seem to determine actual conditions in individual states. Five areas are suggested as an explanation of the incidence, authorization and administrative location of GI/GIS coordinators in individual states. However, none of these explanations are conclusive, since determination of these factors was not the direct focus of this research. Some other factors about states, such as population, geographic size, or location, seem to have minimal influence on these conditions.

6.7.1 State Government Professionalism

The overall professionalism of individual state governments seems to influence GI/GIS conditions. For example, some states are repeatedly recognized as leaders. This leadership is often reflected by attention and dedication of resources to statewide concerns and planning. In addition, some states are early innovators of programs, thus indicating an ability to react to changes and respond to new needs and opportunities. These factors seem to generally correlate with GI/GIS development.

6.7.2 Approach to Information and Information Technology

A second important factor seems to be a state's vision, approach, and effectiveness in information policy and IT. As GI/GIS use and evolution develops, its coordination seems influenced by state government attention to general information. Accordingly, the findings indicate the increasing location of state GI/GIS coordinators in information and IT agencies, with 18 states in this category as of 1995, compared to none in 1985.

However, if institutional conditions fully corresponded to the importance of this factor, the trend would be for virtually all coordinators to be located in an information or IT organization after some degree of GI/GIS development. Alternatively, the findings indicate that 25 states in both 1991 and 1994 have coordinators in other agencies. Until 1994, 10 of the states had their GI/GIS coordinators located in central PPA agencies. In some states, attention and leadership concerning GI/GIS has essentially surpassed that in information and IT in general. For example, PPA agencies are often politically stronger and at a "higher" level than information organizations.

Rationale for this alternative location of GI/GIS coordinators is unclear, and has not been previously examined (chapter 3). However, there are two likely explanations. First, the usual conceptual approach to information and IT does not easily recognize or adopt the geographic perspective experienced in government. This perspective is fundamental to GI/GIS development and coordination. Moreover, some IT organizations have the reputation of having a mainframe computer approach that does not adapt to new technologies and approaches such as with GI/GIS. A second reason for the location of GI/GIS coordinators in planning and administration agencies may be that information and IT organizations typically only address executive branch agencies, while planning agencies are more used to working with external organizations. As GI/GIS develops, the need for coordination with external entities usually increases to help meet the data needs of state agencies.

6.7.3 General and ENR Organizational Structure and Approach

A third factor relevant to institutionalization and administrative location of GI/GIS coordinators is the organizational structure of state government in general. This is particularly true for environmental and natural resources (ENR) functions. It would be useful to correlate general state government organizational structures with GI/GIS institutionalization. However, categorization of states according to an organizational typology has not occurred in recent years. However, trends are for states to reduce the number of agencies and increase functional integration, which can facilitate GI/GIS development and institutionalization.

The organizational framework in which states direct and operate ENR functions is also an important factor, though the organization of ENR in states varies considerably (Warnecke 1994). In particular, redundant and inconsistent mandates and programs may become more apparent when GI/GIS is used, especially when in the same agency. While some ENR agencies were the earliest locations of GI/GIS activities and coordinators, it seems that comprehensive ENR agencies have a stronger possibility of including state GI/GIS coordination functions than agencies with narrower scopes. For example, coordination of various data can help a comprehensive agency meet internal goals. Thus, it may help provide funding and justification for work. Moreover, states with comprehensive ENR agencies may have common natural resources information systems or geographic referencing among related functions that can help in GI/GIS implementation.

6.7.4 State Government Needs and Issues

The needs and issues of individual state governments directly influence the incidence, authorization, and administrative location of GI/GIS coordinators. For example, some states have coordination initiatives specifically focused on GI/GIS, while other states have a specific coordinating mission that in turn serves as a "driver" for GI/GIS coordination. For example, growth management or planning were the early direction for efforts resulting in GI/GIS coordinators in Florida, Maryland, New Hampshire, Vermont and others. Natural resources management was an early and important incentive for GI/GIS use and coordination in many states, while environmental protection was the rationale in others.

Though perhaps not original or leading drivers of activities, state GI/GIS frequently reflect changing state government goals and needs. For example, as explained in chapter 2, emergency management is an integrating goal that is receiving increasing attention and resources. In Colorado, this is a strong goal shared by many agencies using GI/GIS. In South Carolina, economic development is a driving force for GI/GIS data development and integration. Other states are also recently coordinating GI/GIS to meet their economic development goals. In Florida, growth management continues to be the integrating goal shared by agencies using GI/GIS. Waste management was an important need providing funding for much data in Rhode Island.

"Mission-driven" GI/GIS efforts can have some advantages over broad GI/GIS coordination initiatives. For example, mission-driven initiatives may be more successful at achieving external and political support, important to maintain funding. Moreover, resources seem to be more available for high-priority government needs or issues, including for GI/GIS if applicable. If agencies contract with state GI/GIS centers to conduct work, results can also benefit other state purposes. For example, when states competed for the Superconducting Super Collider site in the 1980's, Illinois, North Carolina and other state GI/GIS centers received extra funding to develop data that could be used in their state's proposals. Resulting data were also useful for other state needs. With increasing fiscal constraints, the importance of individual state government needs and issues to GI/GIS are expected to continue.

6.7.5 GI/GIS Resources, Expertise, and Reputation

The availability of resources and expertise strongly influence the establishment and continued existence of state GI/GIS coordinators. The reputation of a state GI/GIS coordinator is also relevant to continue operation, increase authorization and resources, and remain in the same or move to a better administrative location. Regardless of the above factors, if resources such as funding, staffing, data, and technology are not sufficient to support initiatives, then coordinators can not be created or maintain operations.

Qualified and motivated staff are particularly important in any coordination effort. For example, in some states, certain individuals evolved to become GI/GIS coordinators, and their administrative location in a particular agency might become the authorized location. External expertise such as at nearby universities or other organizations can help stimulate initiatives and provide qualified staff.

6.8 Trends and Future Conditions

Determination of the incidence, authorization and administrative location of state GI/GIS coordinators at four equal intervals over a ten year period permits additional evaluation of institutional conditions. GI/GIS activities in states began as early as the 1950's in Washington, and then developed in states including New York, Maryland and Minnesota in the 1960's and 1970's. However, many of these early efforts were essentially experiments for single programs, and actual GI/GIS use was quite limited until the early 1980's. The early part of this decade seemed to mark an important expansion of GI/GIS use, resulting in a third of the states (17) having a state GI/GIS coordinator by 1985. Moreover, 10 of the coordinators were authorized, while seven were unauthorized. Of these efforts, most addressed natural resources and planning information needs. However, individual state needs and conditions seem to result in different priorities for GI/GIS applications and approaches to GI/GIS coordination. Between 1985 and 1988, this trend continued with an increase of 12 coordinators in only three years.

The period between 1988 and 1991 is viewed as having the greatest change of any three year period in terms of attention, use, and coordination of GI/GIS in states. While the increase in coordinators was similar to the previous three years, this period was marked by important increases in their authorization and changes in administrative location. These changes indicate greater state government attention and development regarding GI/GIS institutionalization. This period was also marked by an increase in new and changed

GI/GIS coordinators being located in IIT agencies, while none were located in them in 1985. Growth in this administrative location is particularly noteworthy because in 1988 most GI/GIS coordinators were located in ENR agencies (14), or PPA agencies (9). Since 1988, the number of coordinators located in agencies other than for IIT has essentially remained stable. While important growth and change is clearly evidenced until 1991, only three states established coordinators between 1991 and 1995. However, trends toward more authorization and moves to IIT agencies increased between 1991 and 1994.

These findings provide evidence that states are establishing and authorizing GI/GIS coordinators. This indicates greater institutionalization of GI/GIS coordination in the states, and overall institutional development concerning GI/GIS. Moreover, there is a growing trend toward locating coordinators in central government agencies, and particularly those with IIT leadership in their states. However, there is a significant number of coordinators in PPA agencies, with 10 states in this category in both 1991 and 1994. These conditions indicate that decision makers may be circumventing or challenging information or IT agencies, and placing GI/GIS coordination in conceivably more important and powerful locations within state government organizations.

It is significant that over half of the state coordinators are located in either IIT or PPA agencies, with a marked increase in just a few years. Of these, 22 are authorized, compared to only four that are unauthorized. Location of coordinators in agencies with statewide focus provides additional evidence of institutional development, especially when compared to the federal government.

It is difficult to extrapolate these trends into the future, and particularly as the growth in GI/GIS coordination entities has slowed since 1991. Changes will continue, particularly with an increase in authorized coordinators among the nine states with unauthorized coordinators, and the ten states without a coordinator at all. Other states may also change the administrative location of their coordinator. It is also expected that changed or new GI/GIS coordinators will be located in a central agency, and most likely in a IIT agency. However, conditions in an individual state, and particularly the characteristics and reputation of its information or IT agency, will likely determine the location of state GI/GIS coordinators.

7. Conclusions and Implications

This report examines a new phenomenon impacting government. As GI/GIS use increases and develops, it seems government attention turns to how such use can be most effective and efficient for multiple uses. However, within the nation's system of government, federal, state and local governments often address problems and develop information in isolation from one another. Risks of data redundancy, incompatibility, conflicts, and unnecessary costs are increasing. However, at the same time, the need for accurate and applicable data is also growing. These combined trends seem to encourage governments to institutionalize GI/GIS coordination.

Research addressing GI/GIS institutionalization is quite limited to date, even though it impacts many internal GI/GIS activities and external relations. This report includes evidence of evolution in the use of GIS, and the institutionalization of GI/GIS coordination, with implications that these conditions impact government in general. Original GI/GIS organizational charts and corresponding GI/GIS contact information is provided for each of the 50 states. This information is complimented by synthesis and analysis of this work, concluding that GIS is being applied in essentially all areas of government. In addition, this research reveals that measured over a ten year period, GI/GIS is serving as a catalyst for the establishment of new coordinating organizations and individuals in state governments, herein referred to as "state GI/GIS coordinators".

7.1 Summary of Findings

A thorough examination of the findings of this research is provided in the previous chapter and is summarized below. Four specific factors are investigated for each of the 50 states, including the use of GIS in the executive branches of state governments at one point in time, and the incidence, authorization, and administrative location of state GI/GIS coordinators over a ten year period.

Use of GIS in State Governments

GI/GIS applications are identified in virtually all functions of government, including environmental and natural resources (ENR), transportation, human and social services, public safety, economic development, emergency management, and general administrative and financial organizations. The number of states using GIS in specific categories indicates growth in use, particularly for newer applications, as in human services, and integrating applications such as economic development and emergency management.

Incidence of State GI/GIS Coordinators

An increasing number of states have established internal state GI/GIS coordinators, as 17 of the 50 states had coordinators in 1985, and 41 states have coordinators in 1995.

Authorization of State GI/GIS Coordinators

The number of authorized coordinators is increasing at a greater rate than coordinators in general. Thirty three of the 41 state coordinators in 1995 are authorized, whereas only 10 of the 17 coordinators in 1985 were authorized. At the same time, the actual number of unauthorized coordinators has decreased since 1988, while the total number of coordinators more than doubled since then.

Administrative Location of State GI/GIS Coordinators

State GI/GIS coordinators are increasingly located in central government agencies, with 26 of the 41 identified coordinators located in one of these agencies in 1995. Most coordinators were originally located in agencies with functional roles, particularly one or more environmental or natural resources (ENR) responsibilities. However, many new and relocated coordinators are established in central agencies. Eighteen of the 26 coordinators are located in information or information technology (IIT) organizations in 1995. However, eight coordinators are located in planning, policy, or administration (PPA) agencies, which can be more politically influential and provide greater GI/GIS support than IIT or other locations.

7.2 Significance of Research and Results

This research is significant for several practical and research reasons, providing information and insight for practitioners and scholars alike. Original organizational charts about GI/GIS users and coordinators in each of the 50 states are analyzed and complimented by useful examples and trends that provide ideas and guidance to many organizations institutionalizing GI/GIS coordination.

This work is relevant in the practice and study of government, federalism, and intergovernmental relations as it highlights important new considerations and implications in these regards. It is particularly significant from a public policy perspective, as it reflects growing societal, governing, and federalism trends, and addresses broad government issues. Moreover, most public policy research addresses the development and content of policy and directives, while research attention to mechanisms and implementation has been limited. Focus on institutions, structure and government organizations, and more specifically the incidence of administrative entities, is significant since their presence can indicate a specific result of government action, and they are important measures of the consequences of public policy direction.

This research is also significant in the practice and study of information and information technology (IT). While research is limited, it is important to compare institutional conditions for GI/GIS with those for information and IT in general, and to identify relevant differences so that unique factors and trends can be determined. This information can be used to determine if GI/GIS is challenging traditional government approaches to information and IT.

Research addressing GI/GIS institutionalization in states is particularly important today. The federal government is devolving roles to states and others, particularly with the current political and fiscal climate. At the same time, demand is growing for GI/GIS coordination as use increases. The states seem to be assuming and developing new roles and responsibilities in response to several converging trends, in turn further impacting coordination, governments, institutions, and federalism in general. This state activism is evidenced in many areas, including GI/GIS as concluded in this report.

7.3 Implications, Issues and Future Challenges

This research, while primarily focused on a specific measure of GI/GIS institutionalization, has several implications and identifies emerging issues and challenges.

7.3.1 General Government

Several researchers and practitioners are finding that GI/GIS use and growth seems to be changing government. For example, GI/GIS may have a depoliticizing and democratizing influence on government by increasing the awareness, involvement, and scrutiny of citizens and non-governmental organizations in government. This seems particularly valid as data become more accessible, and technology is easier to use and less expensive. This trend can also mean that government decision-making may be increasingly based on factual conditions rather than partisan interests. GI/GIS also seems to be impacting public policy formulation, as well as program implementation and monitoring. In turn, incentives and encouragement for cooperation and coordination seems to be increasing.

Evidence is also growing that GI/GIS has implications for traditional government approaches to information and IT. As the findings indicate, GI/GIS coordination has largely evolved from a "bottom-up" initiative to an established and authorized role in government. Alternatively, many traditional approaches to information and IT coordination were established as "top-down" forms of management and control in the 1980's. While virtually no research to date has evaluated this condition, these results suggest that GI/GIS is challenging traditional approaches to information and IT. Specifically, the data show that eight states have their GI/GIS coordinator located in a central planning, policy, or administration organization, rather than in their central information or IT organization. Moreover, others have also found that GI/GIS is identifying some legal and economic issues not yet encountered regarding information and IT. For example, some states have specifically modified open records legislation to address the rising demand for data in GIS.

An important finding of this research is that GI/GIS seems to influence interorganizational relations within and among governments and organizations. For example, GI/GIS experiences are revealing redundancies and inconsistencies in agency mandates and programs, since GI/GIS allows data to be observed and analyzed in new ways. Awareness of the confusion and potential waste of resources which results from many governmental entities conducting similar work can lead government leaders to take action. Researchers are finding that GI/GIS has facilitated collaboration, integration, and resolution of differences among various organizations to solve common needs and problems.

It appears that coordination needs are increasingly recognized as GI/GIS develops in governments and other organizations. This coordination need reinforces more general trends toward coordination and integration in government, both between (1) similar functions in different governments, known as "vertical" coordination, and (2) differing functions in the same government, known as "horizontal" coordination. For example, GI/GIS influence on vertical coordination is increasing in environmental and natural resources functions. GI/GIS can also facilitate coordination for other governing functions as GI/GIS develops, such as for human and social services, and transportation and other utilities.

7.3.2 State Governments

State governments are of increasing importance in the American federal system concerning GI/GIS. States have direct authority to respond to their constituency, and federal direction is increasing their roles in areas previously belonging to the federal government.

States also have contiguous boundaries forming a complete subdivision of the land mass of the country. There seems to be an emerging trend that the definition of "state" in the context of GI/GIS is the geographic area of the respective state, not just the state government and its functions and programs. Thus, states seem to be increasingly defined as a community or collection of interests having a broader identity and involving more governing actors than state government. This broader definition of "state" has important implications since the needs and perspectives of external organizations can be reflected in overall direction and funding, but also data policies, priorities and requirements.

Many state GI/GIS activities reflect state leadership and activism in other areas of government. Collectively, states are addressing national issues. For example several state GI/GIS coordinators formed the National States Geographic Information Council (NSGIC) to help further state interests. NSGIC's efforts include promoting recognition of states and localities as equal participants with the federal government in determining national GI/GIS direction.

Institutionalization of GI/GIS coordination is another form of state activism, particularly the existence of state GI/GIS coordinators which are the focus of this research. State GI/GIS coordinators clearly impact GI/GIS coordination and activities in states, and sometimes in other governments and organizations as well, although this is not the focus of this research. Results vary among individual states, however, they all seem to impact direction, resource allocations, data development and prioritization, policies and standards, and coordination relationships.

Differences among the 50 states are important to consider. Some states have highly developed forms of GI/GIS coordination, while other states have relatively undeveloped forms of coordination with limited resources. While the number of authorized coordinators are increasing, the actual authority of most coordinators is quite limited. Primarily they rely on persuasion to meet coordination goals. While the majority of states have a GI/GIS coordinator, ten states in both 1991 and 1994 did not have GI/GIS coordinators. This may indicate a gap between states with coordinators and those without.

In addition, while state GI/GIS coordinators are a measure of GI/GIS institutionalization from a statewide perspective, the importance of GI/GIS coordination at agency and department levels is also important to meet internal and overall state needs. The existence of strong departmental GI/GIS coordinators can substantially support and maximize the benefit of statewide coordinators. In particular, environmental and natural resources (ENR) agencies usually have many internal reasons to develop GI/GIS coordination approaches to meet individual and broad program requirements. Many ENR agencies have had GI/GIS coordinators who later served in a statewide role after developing agency-wide GI/GIS coordination programs. An increasing number of ENR and other agencies are establishing

GI/GIS coordinators that can work as a network of agency-level GIS coordinators with state GI/GIS coordinators.

7.3.3 Federalism and the Federal Government

An important implication of this research may be that GI/GIS is serving as a catalyst for the formation of new governing relationships in the American federal system, with states developing stronger roles in GI/GIS and in the nation's government more generally. Several impacts could result from the increasing devolution of power from federal to state governments, and the decline of federal resources. Examples of state activism are increasing and provide support for this notion, particularly the institutionalization of state GI/GIS coordinators as examined in this report.

Federalism has a unique and direct impact on GI/GIS conditions and institutionalization. For example, federal, state, and local GI/GIS roles and responsibilities are not generally defined. This often results in redundancy and incompatibility of missions, programs, and data. Countries with more centralized governing systems suffer less from these problems. Advocacy for equal state, local and federal participation in national policy-making is based on the principles of federalism and issues concerning the impact of federal actions on national GI/GIS conditions. An important consequence is that support for equal state and local participation in national decision-making, as well as state activism, will most likely increase in the future.

Important differences exist in federal and state GI/GIS institutional conditions that could have important implications for the future, particularly as federal conditions have important impacts on states and others. The Federal Geographic Data Committee (FGDC) is essentially the only GI/GIS coordination and policy group for the entire country. State and other representatives are asked to provide input to federal decisions, but they are not equal participants in making national GI/GIS policy or decisions. FGDC has only federal members. In contrast, many state GI/GIS coordination groups have members from various federal, local and other organizations, as explained in chapter 3. Another limitation of the FGDC is that it seems to concentrate on environmental and natural resources (ENR) matters, and may have a more limited GI/GIS focus than some state GI/GIS coordination efforts.

An important difference between federal and state institutionalization is that since its initiation, FGDC staffing has been administratively located in the National Mapping Division of the Department of Interior's (DOI) Geological Survey. In general, FGDC staff are analogous to state GI/GIS coordinators. However this administrative location is similar to the state-level environment and natural resources (ENR) category in which only 12 states had their GI/GIS coordinators in 1994. Alternatively, these findings reveal that state governments increasingly locate GI/GIS coordinators in central agencies, with 26 coordinators located there in 1995.

7.4 Future Research Needs

There is clearly a growing need for research on GI/GIS institutionalization in all levels of government. More generally, further research, including conceptual and theoretical development, is needed to understand how GI/GIS influences government, institutions and federalism, and conversely, how they impact GI/GIS. Research is also needed to identify and interpret differences between GI/GIS and information and information technologies.

This research addresses GI/GIS institutionalization by focusing specifically on the incidence, authorization, and administrative location of state GI/GIS coordinators. This scope eliminates consideration of related factors that influence GI/GIS coordination and could be the subject of future research. For example, other significant coordinating entities could be investigated, such as departmental GI/GIS coordinators or organizations that impact GI/GIS but are not primarily dedicated to GI/GIS. Other institutionalization measures also warrant further research, such as authorizations, directives and control mechanisms; coordination groups and other coordination mechanisms; and resources allocated and used for GI/GIS coordination.

While this work investigates the incidence, authorization, and administrative location of state GI/GIS coordinators over time, it does not attempt to evaluate or judge GI/GIS conditions or coordinators, or their origin, causation or rationale for changes. It also does not investigate the organizational level at which interagency and intergovernmental coordination and integration is taking place regarding GI/GIS. An important institutional issue not addressed in this work is the level of centralization of GI/GIS and coordination activities. States vary significantly in their coordination roles and activities. For example, some states have a statewide GI/GIS service center, while others have strong departmental GI/GIS activities; some with a statewide coordinator and some without one. These conditions may have important implications. They and the outcome, impacts, effectiveness, and consequences of GI/GIS coordination and coordinators would be fruitful areas of future research.

Additional research could compare states with other governments, and could explore national implications regarding GI/GIS, and government and federalism more generally. An organizational topology was designed which facilitates analysis and comparison of state conditions with other governments. Investigation of intergovernmental and interorganizational arrangements and mechanisms would also be useful concerning GI/GIS coordination. Research on federal-state, state-local and other relations concerning GI/GIS would be informative. Important research could also examine the types, outcome, and impacts of GI/GIS coordination, particularly between governments and functions, to evaluate integration and its impacts. Another idea would be to build on some past research to investigate the involvement, perception, outcome, and effectiveness of other governments participating in state GI/GIS efforts.

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List of Attachments

Tables

1: GIS in State Government; Classified by Function
2: GIS in State Government; Classified by Function (Summary)
3: Incidence, Authorization, and Administrative Location of State GI/GIS Coordinators
4: Authorization of State GI/GIS Coordinators (Summary)
5: Administrative Location of State GI/GIS Coordinators (Summary)

Figures

1: Incidence and Authorization of State GI/GIS Coordinators
2A: Administrative Location of All State GI/GIS Coordinators
2B: Administrative Location of Authorized State GI/GIS Coordinators
2C: Administrative Location of Unauthorized State GI/GIS Coordinators

Organizational Charts for 50 States

Names and Contact Information for 50 States

GIS IN STATE GOVERNMENT; CLASSIFIED BY FUNCTION

(Warnecke, 1994)

STATE	STATEWIDE ADMINISTRATION							ENVIRONMENT/ NATURAL RESOURCES																INFRAS.		HUMAN SERVICES				PUBLIC SAFETY	ECON/ LOCAL	
	SP	B	Lb	R	IR	C	SV	PL	F	GS	AG	CR			OTHER									T	RU	SS	H	ES	Ed	PS	ED	CL
												SH	SA	M	AQ	WT	CT	OGM	SP	WR	FWG	E	NH									
ALABAMA										1										1				1								
ALASKA						1		1	1	1	1							1	1	1	1			1				1		1		1
ARIZONA								1	1						1	1			1	1	1			1				1				
ARKANSAS												1	1							1	1			1			1					
CALIFORNIA		1				1		1	1	1	1				1	1	1		1	1	1	1	1	1			1	1		1		
COLORADO						1		1		1					1					1	1			1								1
CONNECTICUT									1	1	1				1	1			1	1	1		1	1		1	1			1	1	1
DELAWARE										1	1						1		1	1				1			1			1	1	
FLORIDA	1			1				1			1				1		1		1	1	1			1			1			1		
GEORGIA	1									1	1	1			1	1		1		1	1		1	1							1	1
HAWAII	1						1	1	1	1		1					1			1	1			1						1	1	1
IDAHO				1				1	1						1	1				1	1		1	1								
ILLINOIS				1						1	1			1	1	1		1		1	1		1	1			1			1		1
INDIANA		1				1				1					1	1				1	1			1			1			1	1	
IOWA						1			1	1	1					1		1	1	1	1	1		1	1		1			1		
KANSAS										1	1				1	1				1			1	1	1		1					
KENTUCKY				1						1					1	1		1		1	1		1	1								
LOUISIANA	1							1		1							1			1	1			1			1			1	1	
MAINE	1								1	1					1	1	1			1	1		1	1		1	1				1	
MARYLAND	1	1		1				1	1	1	1	1	1		1	1	1		1	1	1		1	1						1		
MASSACHUSETTS		1		1							1	1	1				1			1	1		1	1			1				1	1
MICHIGAN						1		1	1	1	1				1	1		1	1	1	1		1	1			1					
MINNESOTA	1							1	1	1					1	1	1	1	1	1	1			1								
MISSISSIPPI									1	1		1	1				1			1		1		1	1							
MISSOURI							1		1	1					1			1	1	1		1		1			1					
MONTANA			1	1		1		1	1		1	1	1			1		1	1	1	1	1	1	1							1	
NEBRASKA	1		1				1		1	1					1	1		1		1	1			1			1		1	1	1	
NEVADA										1								1		1		1		1			1			1		
NEW HAMPSHIRE									1			1	1			1				1	1		1	1	1							
NEW JERSEY	1							1	1	1		1			1	1	1	1	1	1	1	1	1	1			1			1		1
NEW MEXICO								1	1									1		1	1			1						1	1	
NEW YORK				1	1	1				1		1			1	1	1	1	1	1	1	1	1	1	1	1	1			1		1
NORTH CAROLINA		1	1			1		1		1	1	1	1		1	1	1	1	1	1	1	1		1					1	1	1	1
NORTH DAKOTA								1		1	1	1	1		1	1		1		1	1			1	1							
OHIO		1						1		1		1	1		1	1		1		1	1			1	1					1	1	
OKLAHOMA				1		1				1	1		1		1			1		1				1						1		
OREGON				1				1	1	1	1					1	1	1	1	1	1	1		1						1		
PENNSYLVANIA						1			1	1	1	1				1				1	1			1			1	1				
RHODE ISLAND									1		1	1				1				1	1			1							1	
SOUTH CAROLINA									1	1		1	1		1	1	1			1			1	1			1				1	
SOUTH DAKOTA											1								1		1			1								
TENNESSEEE	1	1								1	1									1	1			1			1			1	1	
TEXAS								1							1		1	1	1	1	1		1	1	1	1	1			1	1	
UTAH	1			1				1	1	1	1	1	1		1	1		1	1	1	1	1	1	1			1			1	1	
VERMONT									1	1	1	1	1			1			1	1	1		1	1	1				1			
VIRGINIA	1	1		1		1			1	1	1	1			1	1	1	1		1	1		1	1			1			1		
WASHINGTON		1				1		1	1	1	1	1	1		1	1	1	1	1	1	1	1		1		1	1	1			1	1
WEST VIRGINIA										1	1							1		1	1			1							1	
WISCONSIN							1	1	1	1	1				1				1	1	1			1		1						1
WYOMING				1						1		1								1	1			1								
TOTAL	12	9	3	13	1	13	4	22	27	39	27	19	14	1	29	30	18	24	22	49	42	12	20	50	9	6	25	5	3	24	20	12

SP-STATE PLANNING, POLICY
B- BUDGET, FINANCE, COMPTROLLER, STATE PROPERTY MANAGEMENT
Lb- LIBRARY
R-REVENUE, PROPERTY TAX ADMINIATRATION
IR-INSURANCE, REGULATION
C- CENSUS DATA CENTER
SV- STATE SURVEYOR, CARTOGRAPHER, GEOGRAPHER
PL- PUBLIC LANDS MANAGEMENT
F- STATE FORESTRY
GS- STATE GEOLOGICAL SURVEY
AG- AGRICULTURE

CR- CULTURAL RESOURCES
SH- STATE HISTORIC PRESERVATION OFFICE
SA- STATE ARCHAEOLOGICAL SURVEY
M- MUSEUM
AQ-AIR QUALITY
WT- WASTE MANAGEMENT, INCLUDING LOW LEVEL
CT- COASTAL RESOURCES
OGM- OIL, GAS,AND MINING RECLAMATION
SP-STATE PARKS
WR - WATER RESOURCES
FWG- FISH, WILDLIFE AND GAME

E- ENERGY
NH- NATURAL HERITAGE PROGRAM
T- TRANSPORTATION
RU- REGULATORY UTILITIES COMMISSION
SS- SOCIAL SERVICES, AGING, YOUTH PROGRAMS
H- HUMAN HEALTH
ES- EMPLOYMENT SECURITY, LABOR
Ed- EDUCATION
PS - PUBLIC SAFETY, EMERGENCY MANAGEMENT
ED- ECONOMIC DEVELOPMENT, COMMERCE, TOURISM
CL- COMMUNITY, LOCAL AFFAIRS

Table 1: GIS in State Government; Classified by Function

Table 2: GIS in State Government; Classified by Function (Summary)
Warnecke, 1994

General State Government:
Planning, Administration, Finance, Revenue, Asset Management

13	Revenue, including Property Taxation
13	Census Data Center
12	State Planning
9	Budget, Finance, Comptroller, State Property Management
4	State Surveyor, Cartographer, Geographer
3	Library
1	Banking Regulation

Environmental/Natural Resources

49	Water - Quantity, Quality, Rights, or Drinking
42	Wildlife, Game, Fish or Biological Resources
39	Geological Survey
30	Waste Management, including Solid, Low Level
29	Air Quality
27	State Forestry Organization
27	Agriculture
24	Oil/Gas/Mining Regulation and Reclamation
22	Public Lands Management
22	Parks Management
20	Natural Heritage Program
18	Coastal Resources
12	Energy

Cultural Resources

19	Historic Preservation
14	Archaeology
1	Other - Museum

Infrastructure

50	Transportation
9	Utility Regulatory Commissions

Human Services

25	Health (primarily epidemiology)
6	Social Services
5	Employment Security and Labor
3	Education

24	Public Safety, Emergency Management and Military
20	Economic Development
20	Community and Local Affairs

Table 3: Incidence, Authorization, and Administrative Location of State GI/GIS Coordinators (page 1 of 2)

Warnecke, 1995

	1985	1988	1991	1994	1995
Alabama	-	-	-	-	-
Alaska	-	-	-	-	-
Arizona	A E	A E	A E	A E	A E
Arkansas	-	-	A I	A I	A I
California	-	U I	U I	U I	U I
Colorado	-	-	-	-	-
Connecticut	U E	U E	A P	A P	A I
Delaware	-	A I	A I	A I	A I
Florida	-	A P	A P	A I	A I
Georgia	-	-	A S	-	-
Hawaii	-	A P/I	A P/I	A P/I	A P/I
Idaho	A E	A E	A E	A E	A E
Illinois	U E	U E	U E	U E	A E
Indiana	-	-	A P	A I	A I
Iowa	-	-	A E	A E	A E
Kansas	-	-	A E/E	A E/E	A E/E
Kentucky	-	U I	U I	A P	A P
Louisiana	-	-	-	-	A I
Maine	A E	A E	A E/I	A I	A I
Maryland	U P	U P	U P	U P	U P
Massachusetts	-	-	U E/I	U E/I	U E/I
Michigan	A E	A E	A E/S	A E/S	A E/S
Minnesota	U P	U P	A I	A P	A P
Mississippi	A S	A S	A S	A S	A S
Missouri	-	-	-	-	-

Key

- = No Coordinator

A = Authorized
U = Unauthorized

P = Planning, Policy, or Administration Agency
I = Information Policy or Technology Agency
E = Environmental or Natural Resources Agency
S = Other State Government Agency
N = Non-State Government Organization

Table 3: Incidence, Authorization, and Administrative Location of State GI/GIS Coordinators (page 2 of 2)

Warnecke, 1995

	1985	1988	1991	1994	1995
Montana	A S	A S	A S	A S	A S
Nebraska	-	-	-	A I	A I
Nevada	-	-	-	-	-
New Hampshire	A P/N	A P/N	A P/N	A P/N	A P/N
New Jersey	-	U E	U E	U E	U E
New Mexico	-	-	A I/N	A I/N	A I/N
New York	-	-	-	-	-
North Carolina	U E	U E	A P	A P	A I
North Dakota	-	-	A I	A I	A I
Ohio	U E	U E	A I	A I	A I
Oklahoma	-	-	A E	A E	A E
Oregon	-	U E	A E	A I	A I
Pennsylvania	-	U I	U I	-	-
Rhode Island	-	U P/N	A P/N	A P/N	A P/N
South Carolina	-	-	-	U E	U E
South Dakota	-	U E	U E	U E	U E
Tennessee	A P/E	A P/E	U E	U I/E	U I/E
Texas	A E	A E	A E	A I/E	A I/E
Utah	A E	A E	A I	A I	A I
Vermont	-	A P	A P	A N	A N
Virginia	-	A P	A I	A P	A I
Washington	U E	U E	U I	U I	U I
West Virginia	-	-	A S	A E	A E
Wisconsin	-	-	A P	A P	A P
Wyoming	-	-	-	-	-

Key

- = No Coordinator

A = Authorized
U = Unauthorized

P = Planning, Policy, or Administration Agency
I = Information Policy or Technology Agency
E = Environmental or Natural Resources Agency
S = Other State Government Agency
N = Non-State Government Organization

Table 4: Authorization of State GI/GIS Coordinators (Summary)

Warnecke, 1995

Year	Authorized		Unauthorized		Total
	Number	Percentage	Number	Percentage	
1985	10	59%	7	41%	17
1988	15	52%	14	48%	29
1991	30	75%	10	25%	40
1994	31	77.5%	9	22.5%	40
1995	33	80.5%	8	19.5%	41

Table 5: Administrative Location of State GI/GIS Coordinators (Summary)

Year	PPA	IIT	ENR	State	Non	Total
1985	4	0	11	2	0	17
1988	9	4	14	2	0	29
1991	10	12	14	4	0	40
1994	10	15	12	2	1	40
1995	8	18	12	2	1	41

Key

PPA = Planning, Policy, or Administration Agency
IIT = Information Policy or Technology Agency
ENR = Environmental or Natural Resources Agency
State = Other State Government Agency
Non = Non-State Government Organization

Figure 1: Incidence and Authorization of State GI/GIS Coordinators

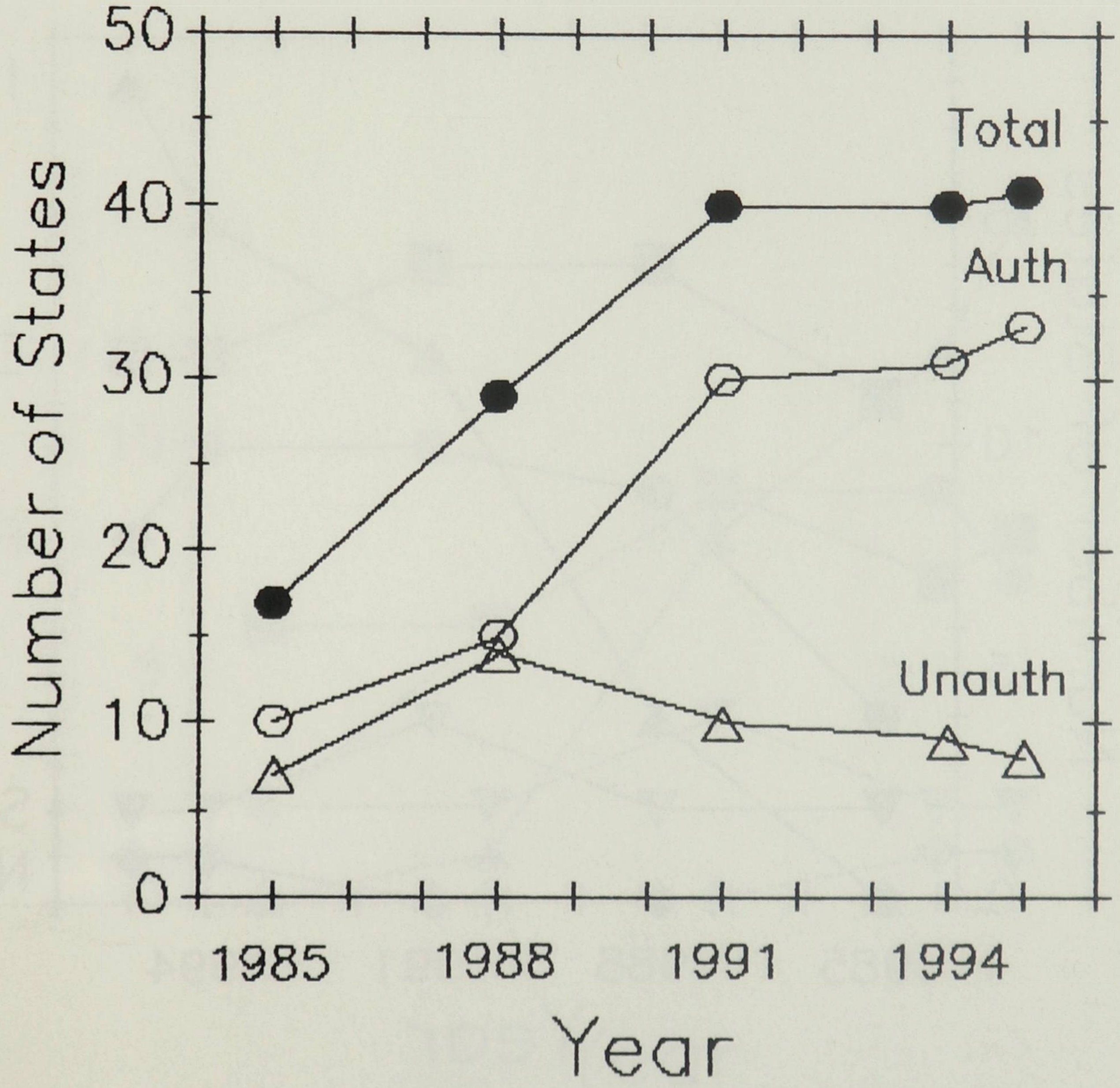
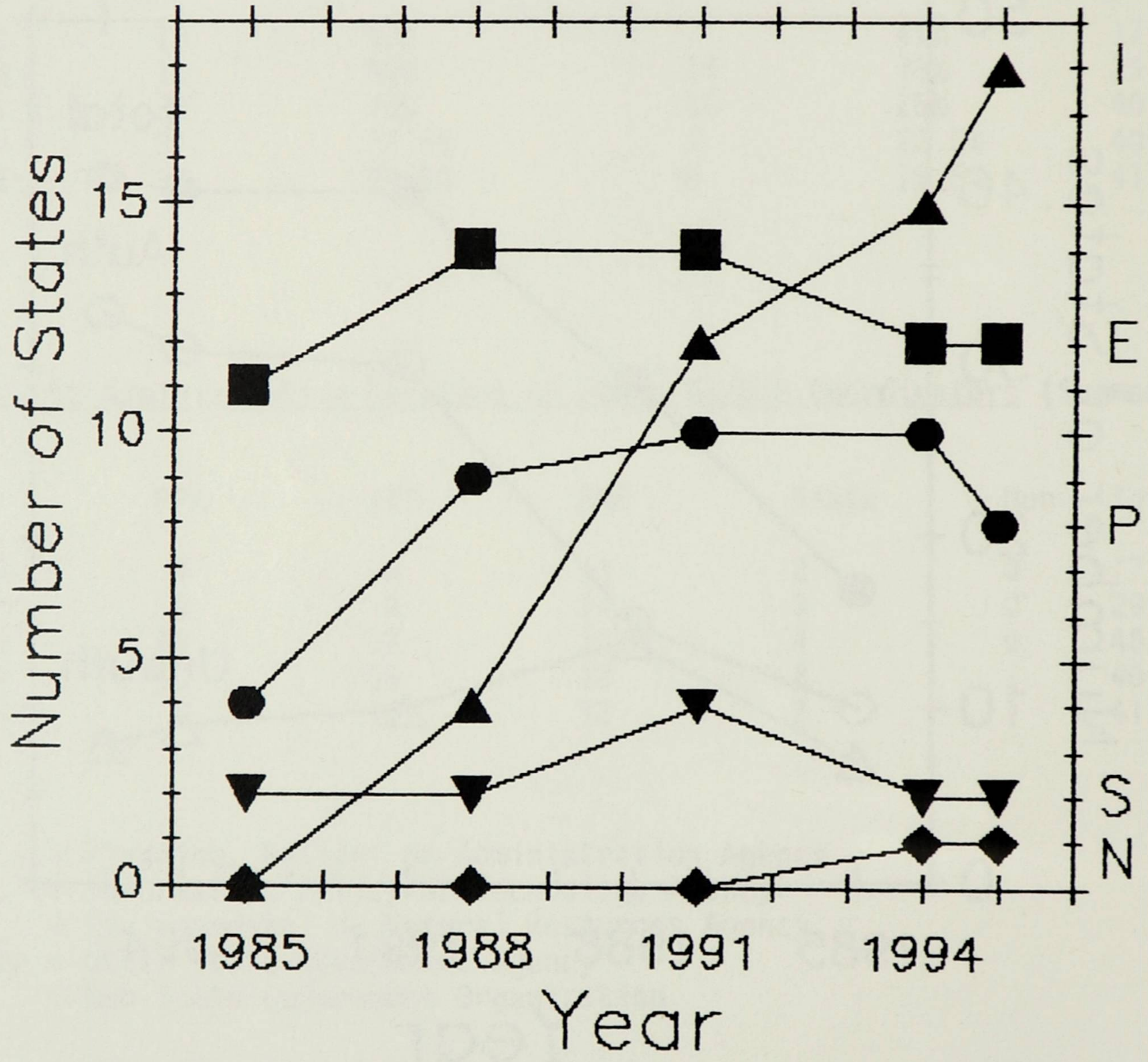
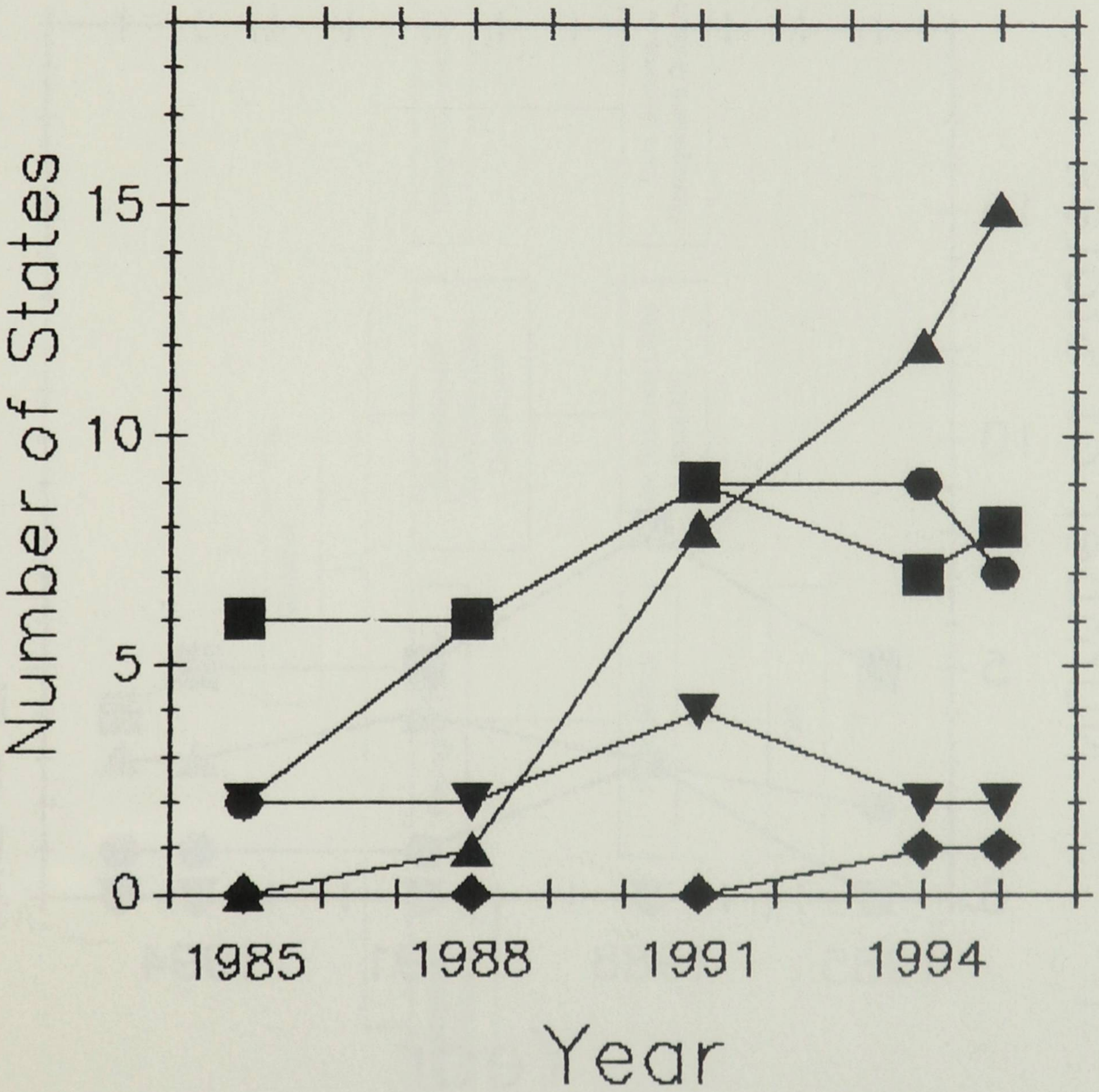


Figure 2A: Administrative Location of All State GI/GIS Coordinators



Key
P = Planning, Policy, or Administration Agency
I = Information Policy or Technology Agency
E = Environmental or Natural Resources Agency
S = Other State Government Agency
N = Non-State Government Organization

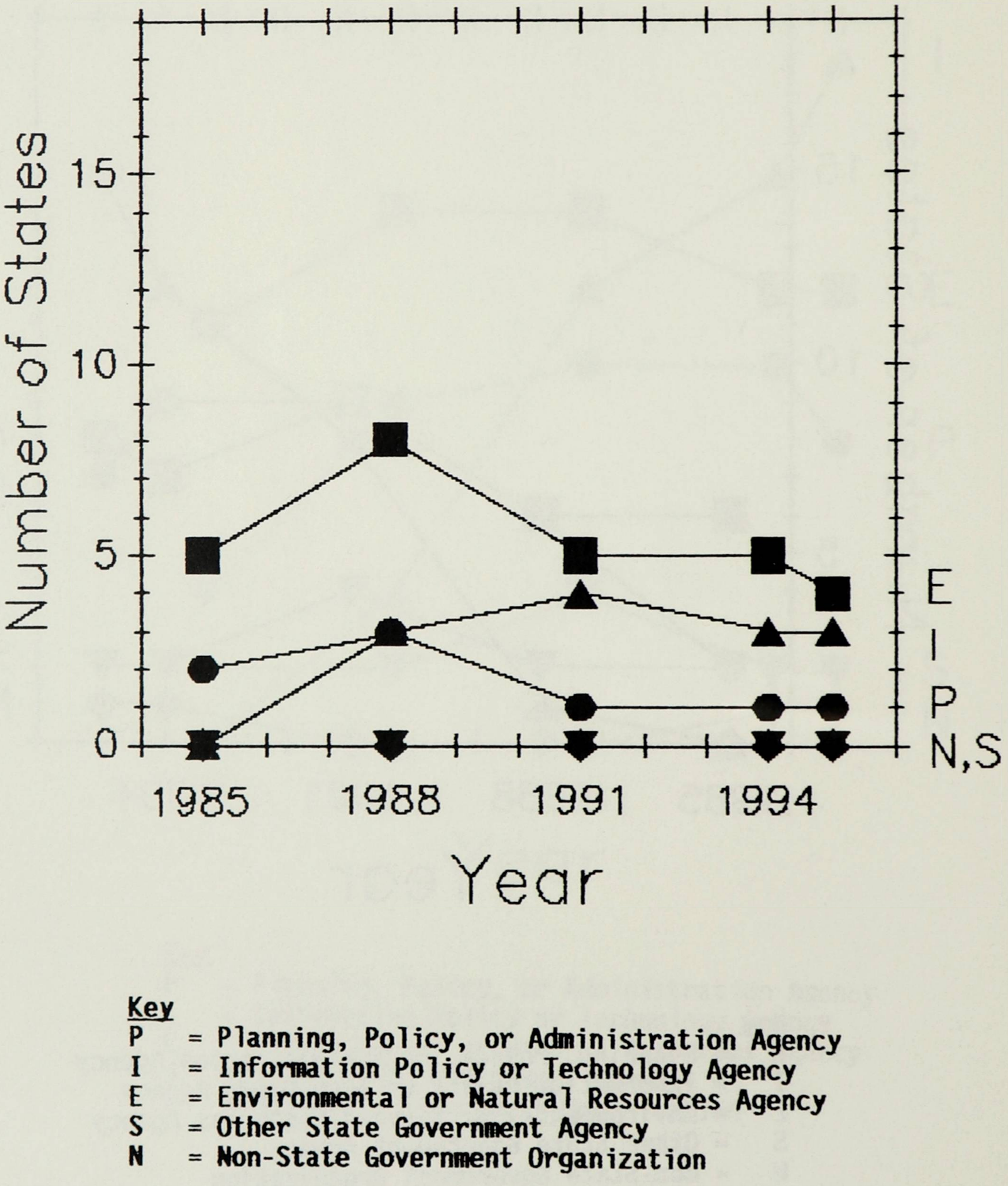
Figure 2B: Administrative Location of Authorized State GI/GIS Coordinators



Key

P = Planning, Policy, or Administration Agency
I = Information Policy or Technology Agency
E = Environmental or Natural Resources Agency
S = Other State Government Agency
N = Non-State Government Organization

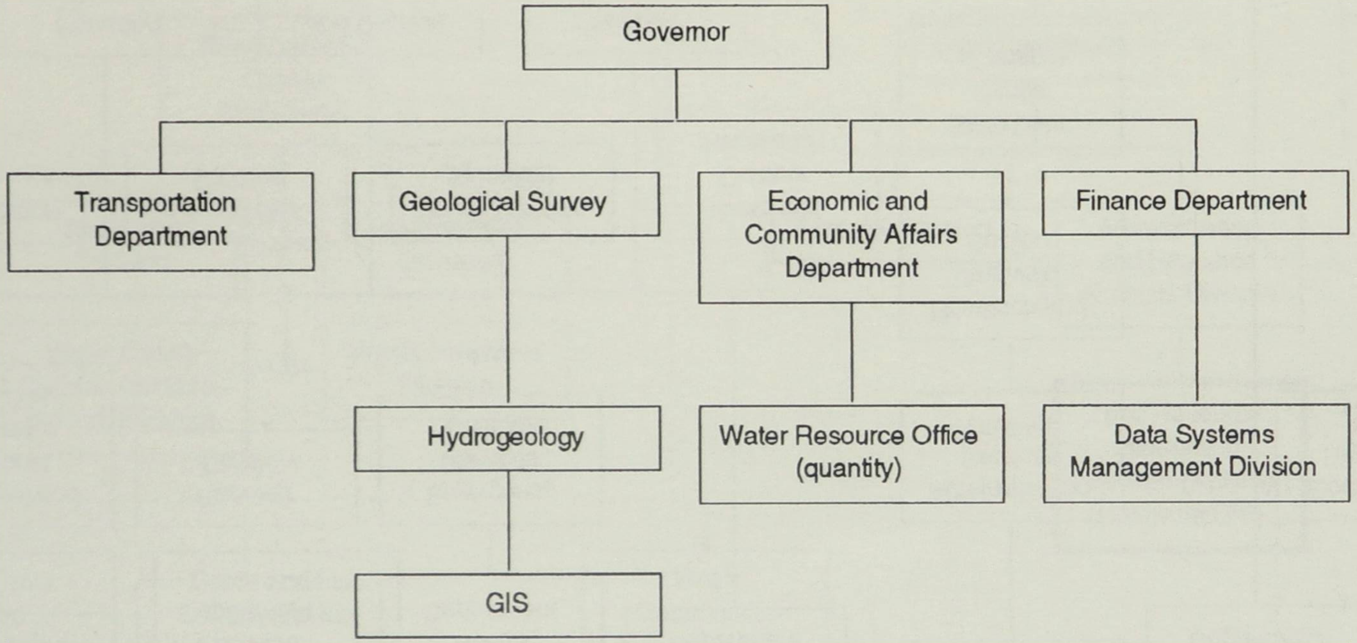
Figure 2C: Administrative Location of Unauthorized State GI/GIS Coordinators



Key

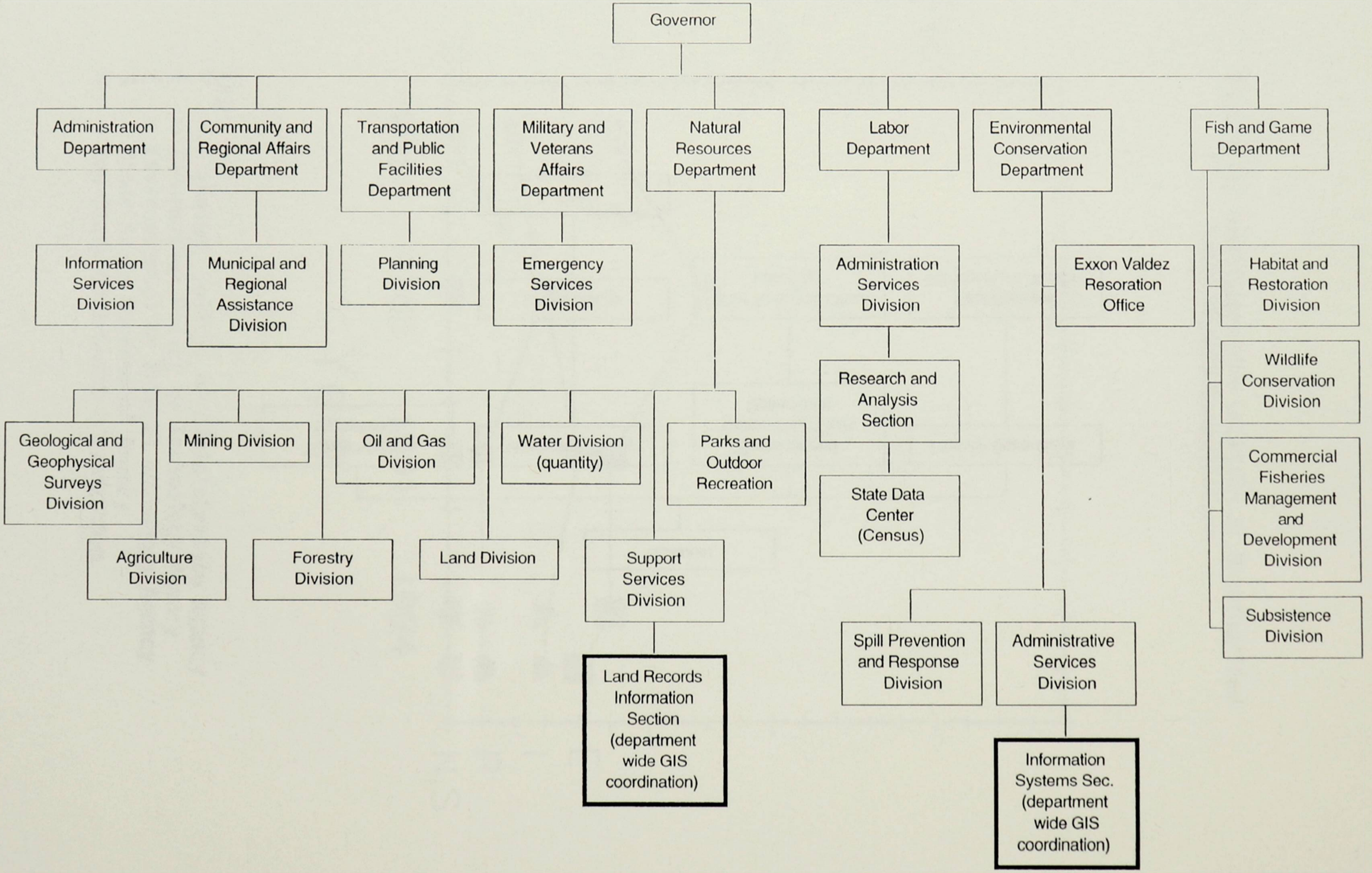
P = Planning, Policy, or Administration Agency
I = Information Policy or Technology Agency
E = Environmental or Natural Resources Agency
S = Other State Government Agency
N = Non-State Government Organization

Warnecke, 1994


Governor
Transportation Department
Geological Survey
Economic and Community Affairs Department
Finance Department
Hydrogeology
Water Resource Office (quantity)
Data Systems Management Division
GIS

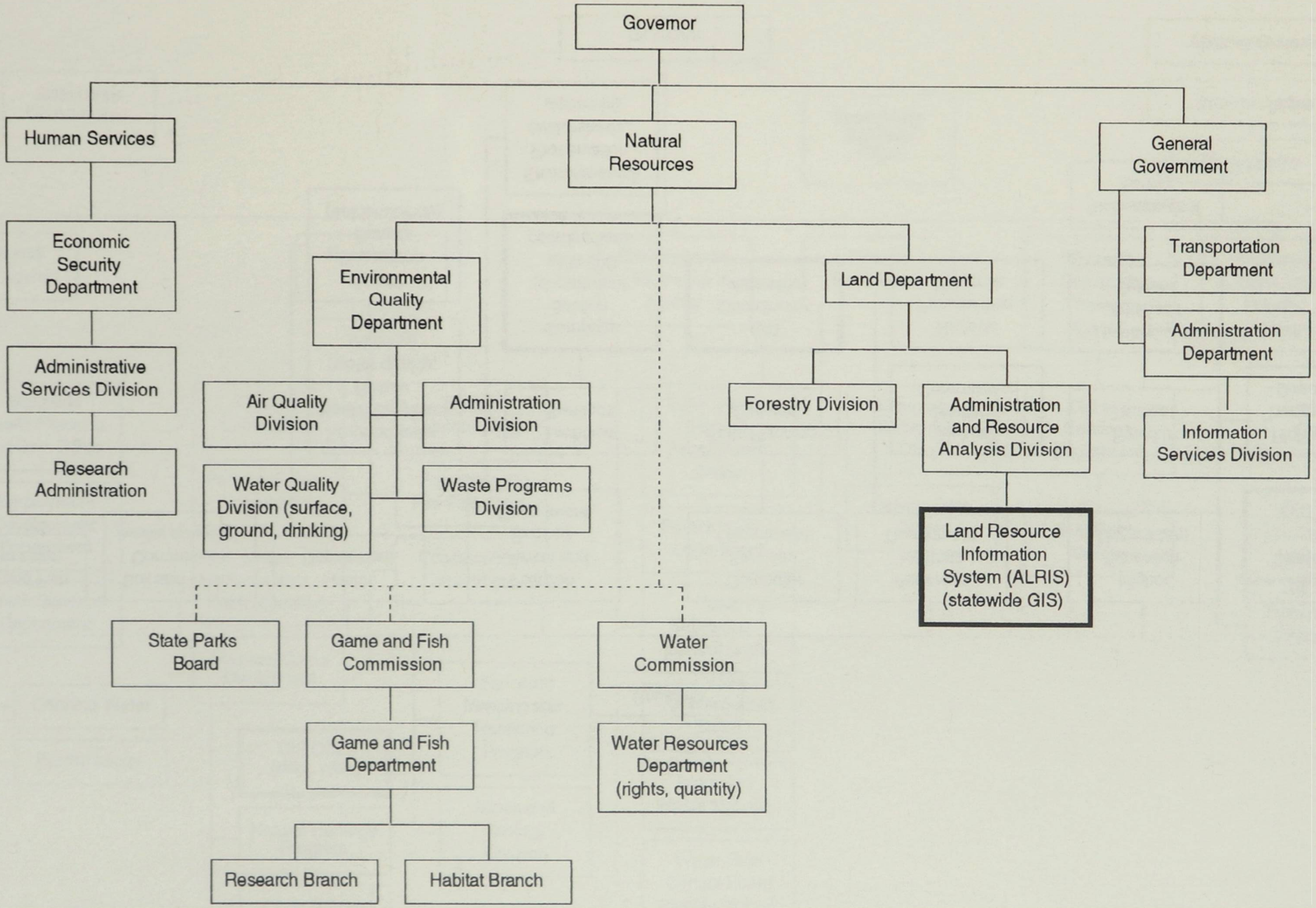
Alabama - GI/GIS

Alaska - GI/GIS



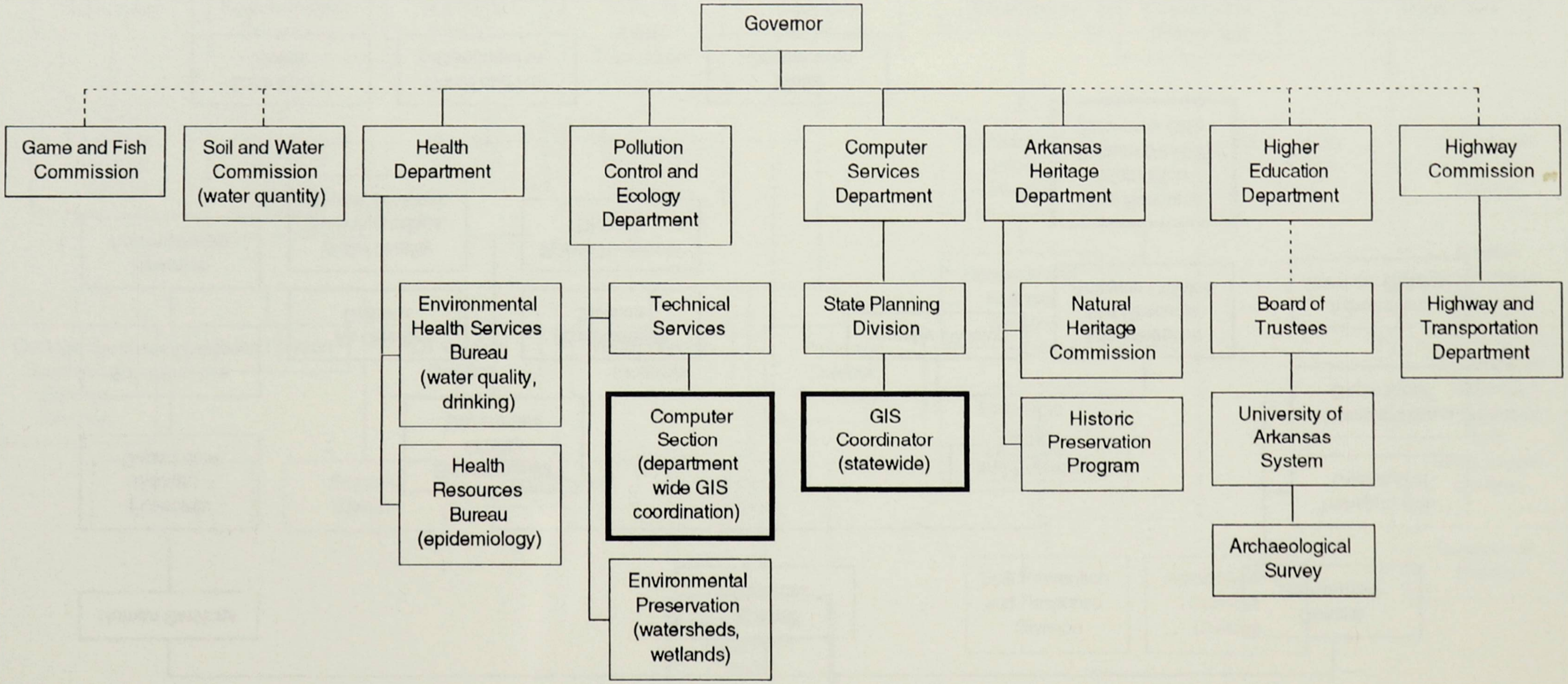
- Governor
  - Administration Department
    - Information Services Division
  - Community and Regional Affairs Department
    - Municipal and Regional Assistance Division
  - Transportation and Public Facilities Department
    - Planning Division
  - Military and Veterans Affairs Department
    - Emergency Services Division
  - Natural Resources Department
    - Geological and Geophysical Surveys Division
    - Agriculture Division
    - Mining Division
    - Forestry Division
    - Oil and Gas Division
    - Land Division
    - Water Division (quantity)
    - Support Services Division
      - **Land Records Information Section (department wide GIS coordination)**
    - Parks and Outdoor Recreation
  - Labor Department
    - Administration Services Division
      - Research and Analysis Section
        - State Data Center (Census)
  - Environmental Conservation Department
    - Exxon Valdez Resoration Office
    - Spill Prevention and Response Division
    - Administrative Services Division
      - **Information Systems Sec. (department wide GIS coordination)**
  - Fish and Game Department
    - Habitat and Restoration Division
    - Wildlife Conservation Division
    - Commercial Fisheries Management and Development Division
    - Subsistence Division

Warnecke, 1994


Governor
Human Services
Natural Resources
General Government
Economic Security Department
Administrative Services Division
Research Administration
Environmental Quality Department
Air Quality Division
Administration Division
Water Quality Division (surface, ground, drinking)
Waste Programs Division
Land Department
Forestry Division
Administration and Resource Analysis Division
Land Resource Information System (ALRIS) (statewide GIS)
Transportation Department
Administration Department
Information Services Division
State Parks Board
Game and Fish Commission
Game and Fish Department
Research Branch
Habitat Branch
Water Commission
Water Resources Department (rights, quantity)

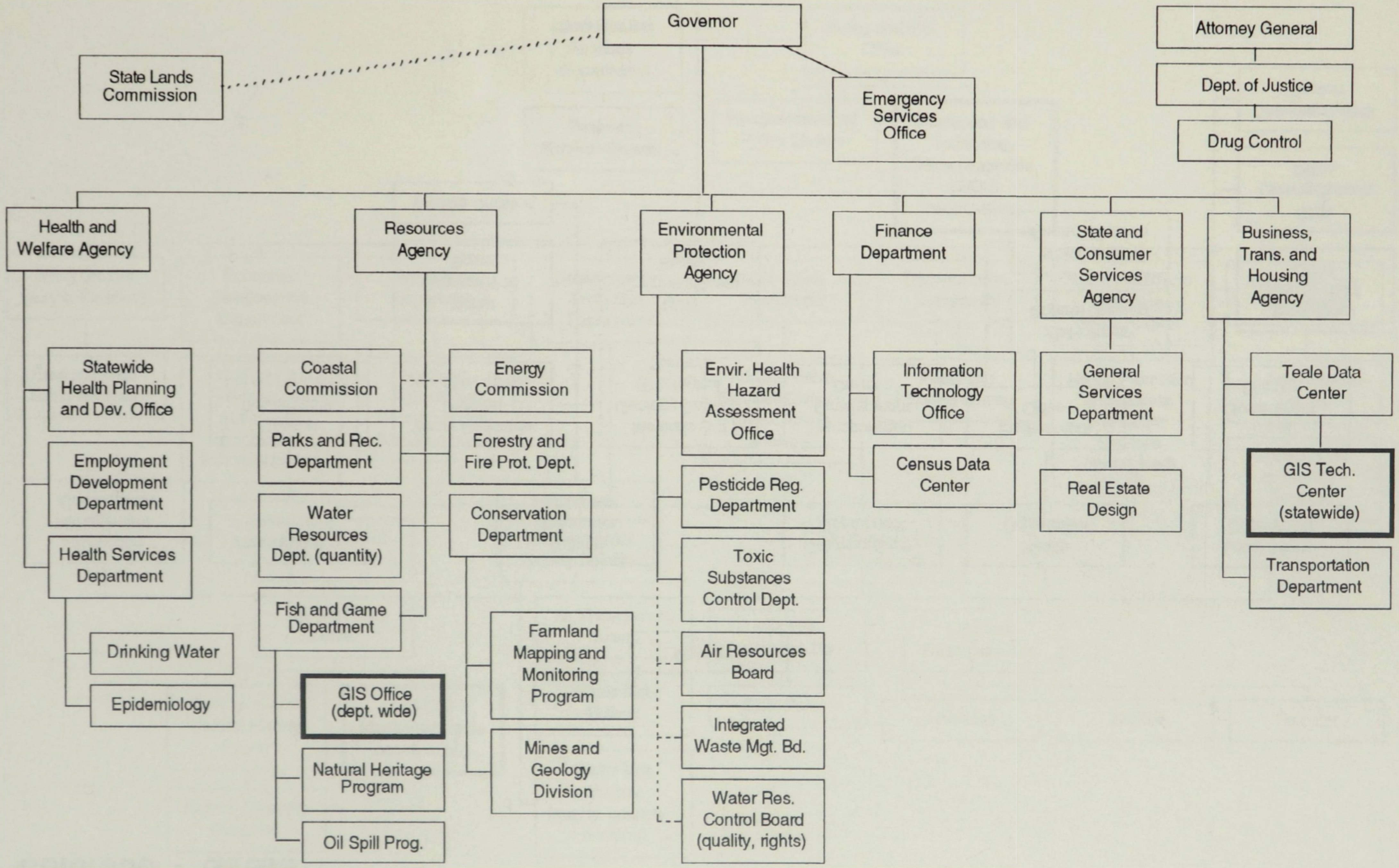
Arizona - GI/GIS

Arkansas - GI/GIS



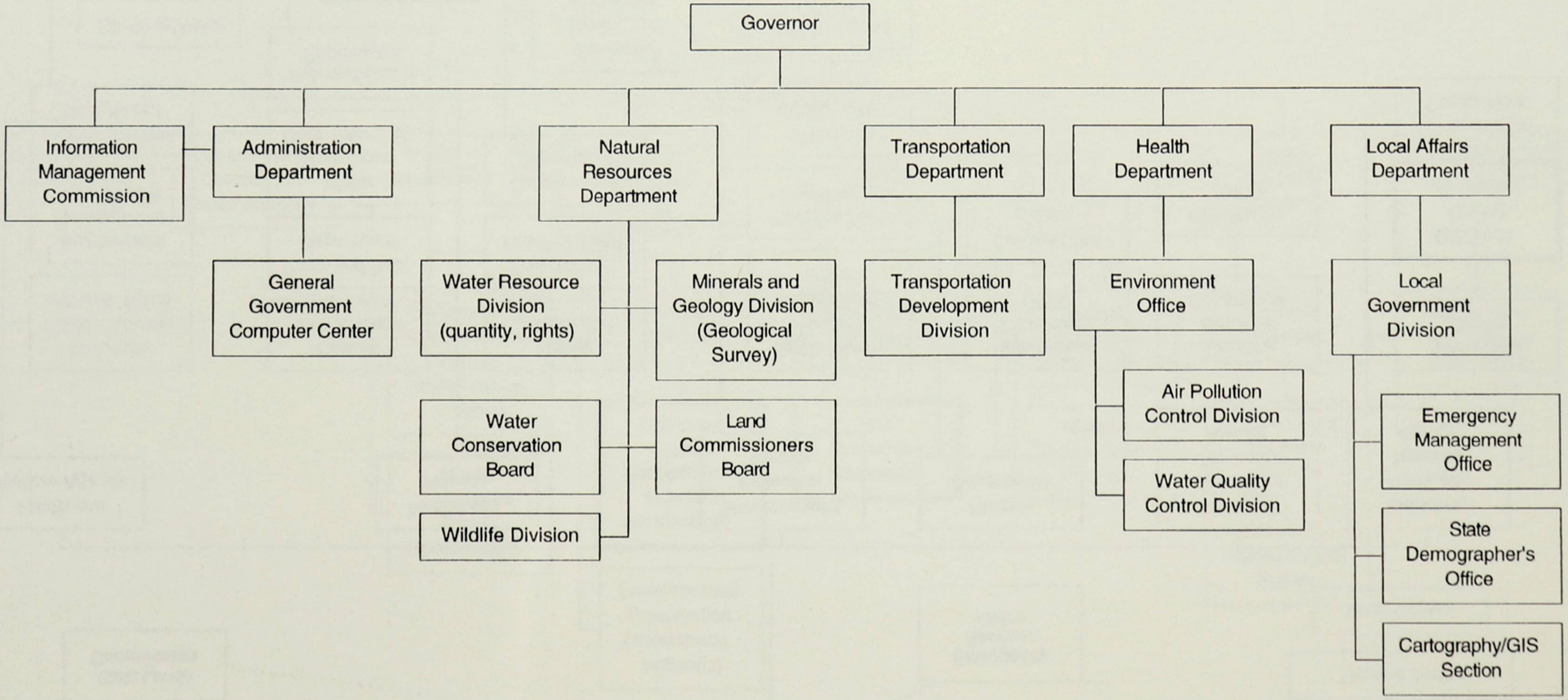
- Governor
  - Game and Fish Commission
  - Soil and Water Commission (water quantity)
  - Health Department
    - Environmental Health Services Bureau (water quality, drinking)
    - Health Resources Bureau (epidemiology)
  - Pollution Control and Ecology Department
    - Technical Services
      - Computer Section (department wide GIS coordination)
    - Environmental Preservation (watersheds, wetlands)
  - Computer Services Department
    - State Planning Division
      - GIS Coordinator (statewide)
  - Arkansas Heritage Department
    - Natural Heritage Commission
    - Historic Preservation Program
  - Higher Education Department
    - Board of Trustees
      - University of Arkansas System
        - Archaeological Survey
  - Highway Commission
    - Highway and Transportation Department

Warnecke, 1994


Governor
State Lands Commission
Emergency Services Office
Attorney General
Dept. of Justice
Drug Control
Health and Welfare Agency
Statewide Health Planning and Dev. Office
Employment Development Department
Health Services Department
Drinking Water
Epidemiology
Resources Agency
Coastal Commission
Energy Commission
Parks and Rec. Department
Forestry and Fire Prot. Dept.
Water Resources Dept. (quantity)
Conservation Department
Fish and Game Department
GIS Office (dept. wide)
Natural Heritage Program
Oil Spill Prog.
Farmland Mapping and Monitoring Program
Mines and Geology Division
Environmental Protection Agency
Envir. Health Hazard Assessment Office
Pesticide Reg. Department
Toxic Substances Control Dept.
Air Resources Board
Integrated Waste Mgt. Bd.
Water Res. Control Board (quality, rights)
Finance Department
Information Technology Office
Census Data Center
State and Consumer Services Agency
General Services Department
Real Estate Design
Business, Trans. and Housing Agency
Teale Data Center
GIS Tech. Center (statewide)
Transportation Department

California - GI/GIS

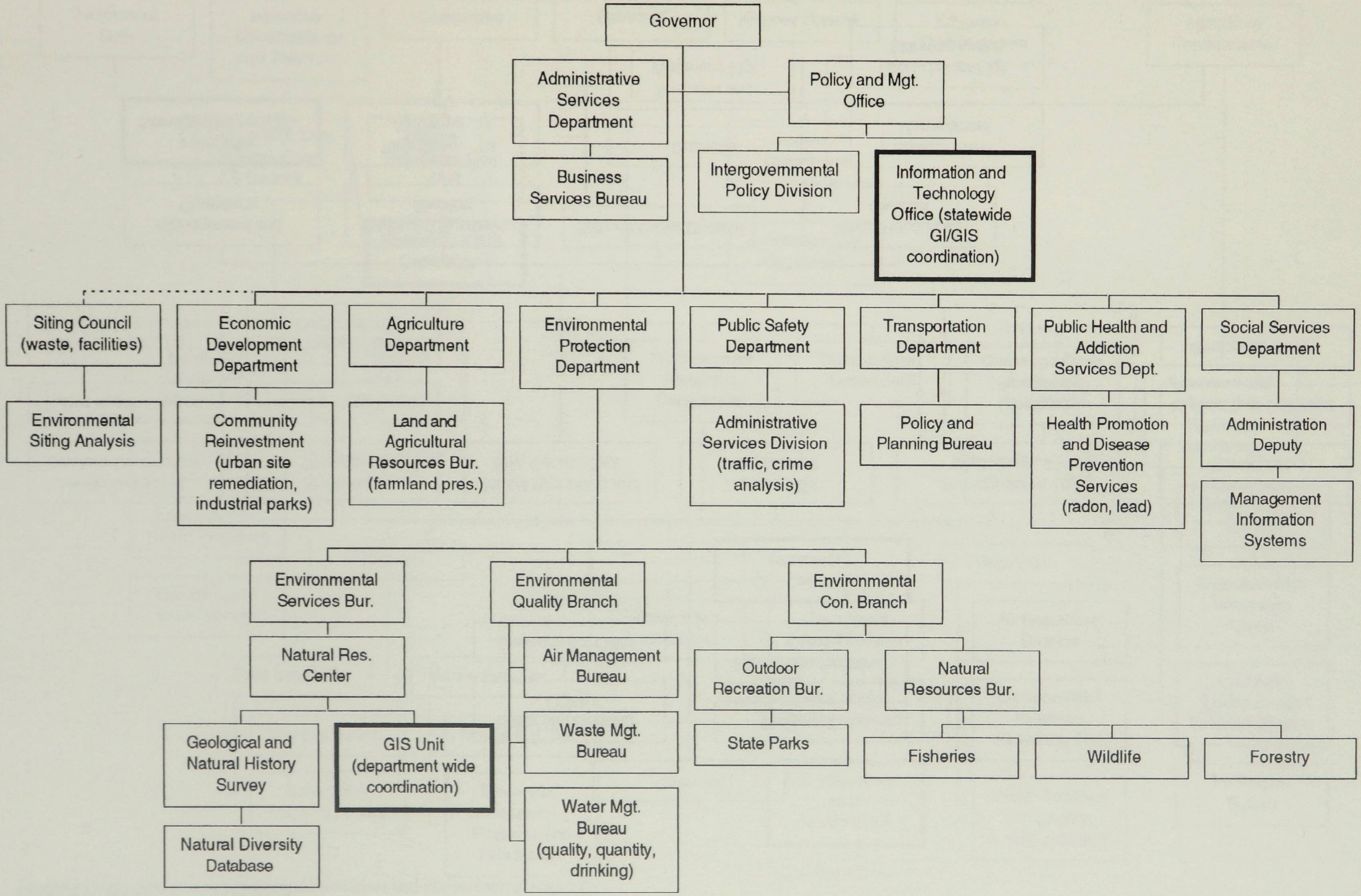
Colorado - GI/GIS



- Governor
  - Information Management Commission
  - Administration Department
    - General Government Computer Center
  - Natural Resources Department
    - Water Resource Division (quantity, rights)
    - Minerals and Geology Division (Geological Survey)
    - Water Conservation Board
    - Land Commissioners Board
    - Wildlife Division
  - Transportation Department
    - Transportation Development Division
  - Health Department
    - Environment Office
      - Air Pollution Control Division
      - Water Quality Control Division
  - Local Affairs Department
    - Local Government Division
      - Emergency Management Office
      - State Demographer's Office
      - Cartography/GIS Section

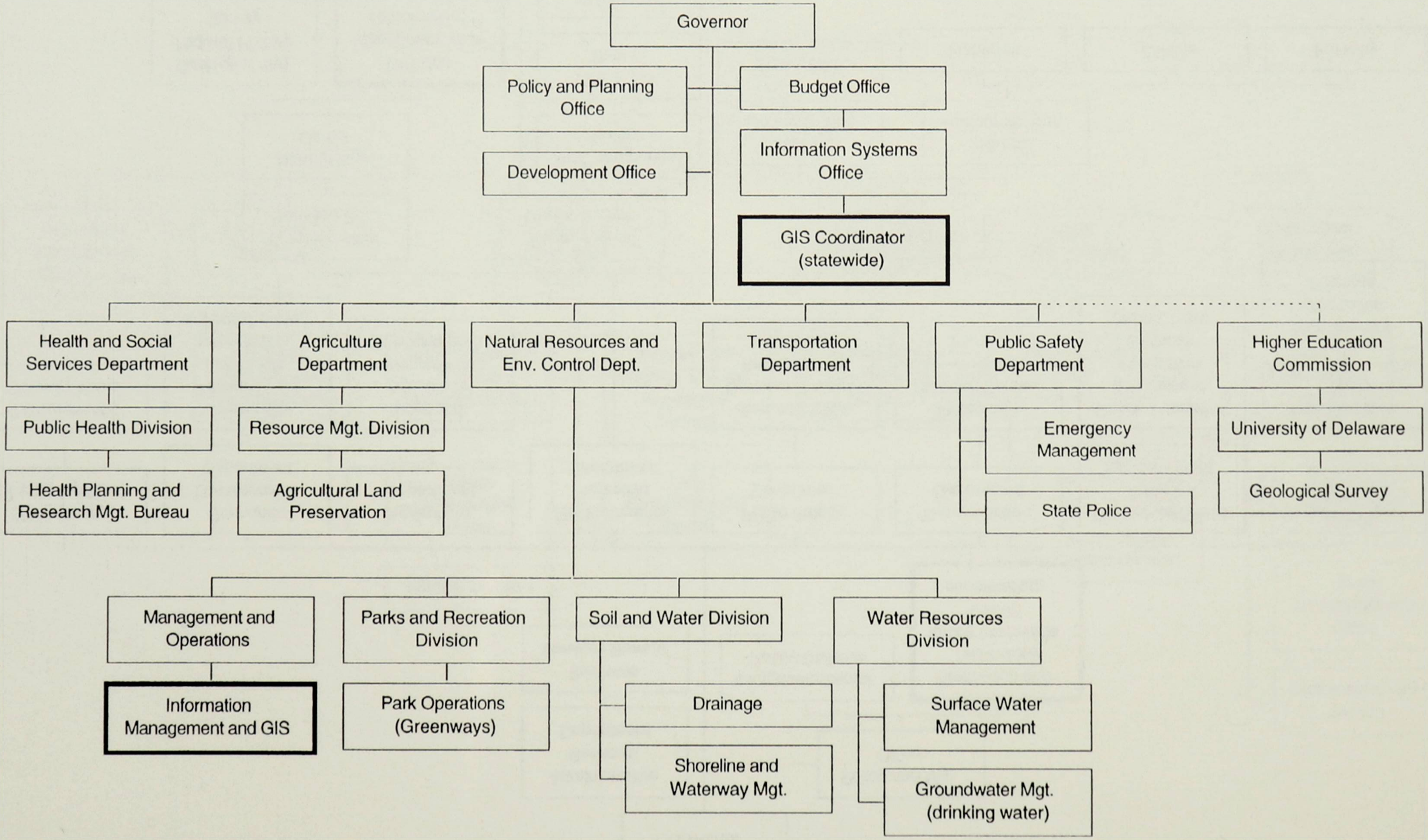
Warnecke, 1994

Warnecke, 1995


Governor
Administrative Services Department
Business Services Bureau
Policy and Mgt. Office
Intergovernmental Policy Division
Information and Technology Office (statewide GI/GIS coordination)
Siting Council (waste, facilities)
Environmental Siting Analysis
Economic Development Department
Community Reinvestment (urban site remediation, industrial parks)
Agriculture Department
Land and Agricultural Resources Bur. (farmland pres.)
Environmental Protection Department
Public Safety Department
Administrative Services Division (traffic, crime analysis)
Transportation Department
Policy and Planning Bureau
Public Health and Addiction Services Dept.
Health Promotion and Disease Prevention Services (radon, lead)
Social Services Department
Administration Deputy
Management Information Systems
Environmental Services Bur.
Natural Res. Center
Geological and Natural History Survey
Natural Diversity Database
GIS Unit (department wide coordination)
Environmental Quality Branch
Air Management Bureau
Waste Mgt. Bureau
Water Mgt. Bureau (quality, quantity, drinking)
Environmental Con. Branch
Outdoor Recreation Bur.
State Parks
Natural Resources Bur.
Fisheries
Wildlife
Forestry

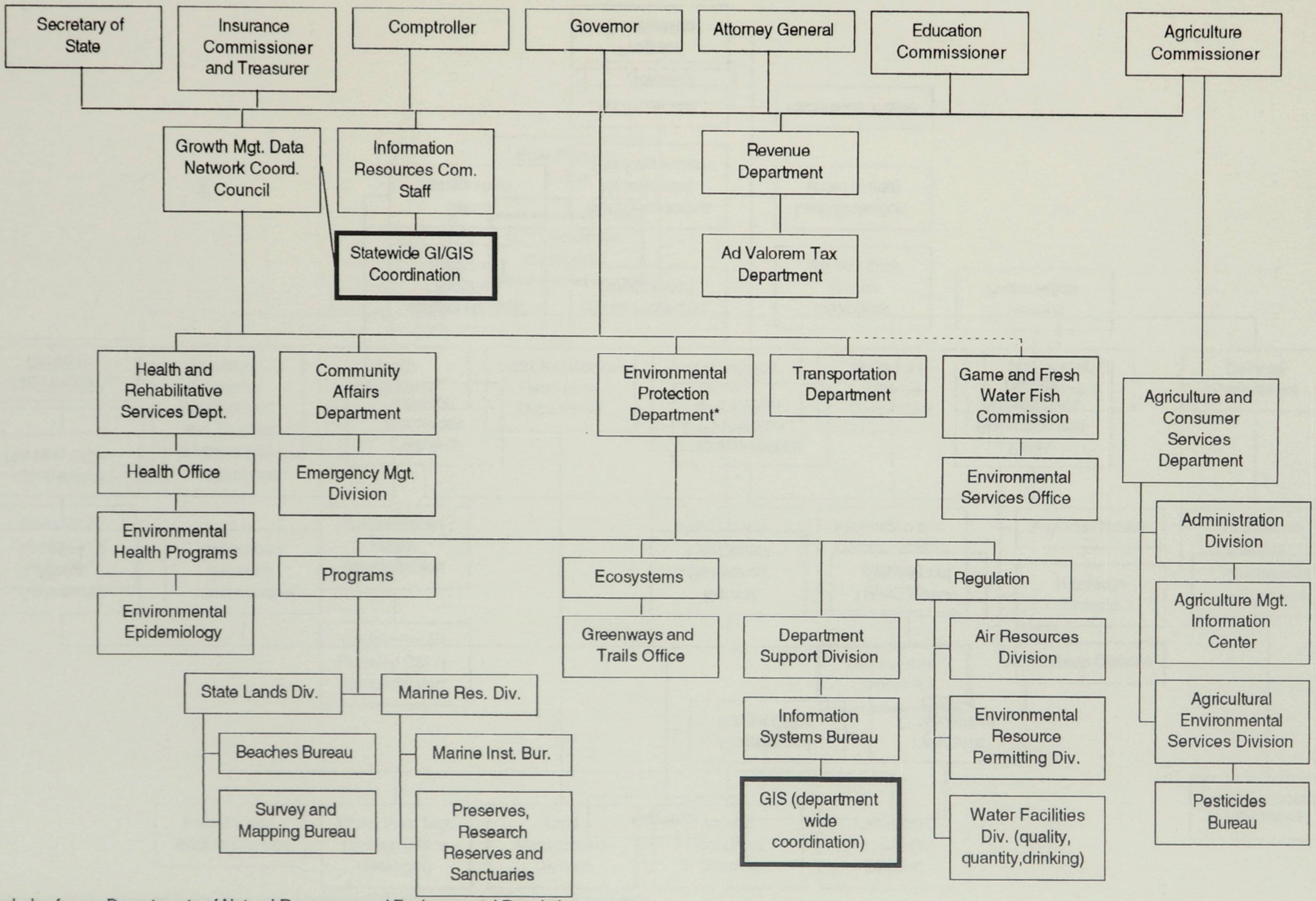
Connecticut - GI/GIS

Delaware - GI/GIS



- Governor
  - Policy and Planning Office
  - Development Office
  - Budget Office
    - Information Systems Office
      - GIS Coordinator (statewide)
  - Health and Social Services Department
    - Public Health Division
      - Health Planning and Research Mgt. Bureau
  - Agriculture Department
    - Resource Mgt. Division
      - Agricultural Land Preservation
  - Natural Resources and Env. Control Dept.
    - Management and Operations
      - Information Management and GIS
    - Parks and Recreation Division
      - Park Operations (Greenways)
    - Soil and Water Division
      - Drainage
      - Shoreline and Waterway Mgt.
    - Water Resources Division
      - Surface Water Management
      - Groundwater Mgt. (drinking water)
  - Transportation Department
  - Public Safety Department
    - Emergency Management
    - State Police
  - Higher Education Commission
    - University of Delaware
      - Geological Survey

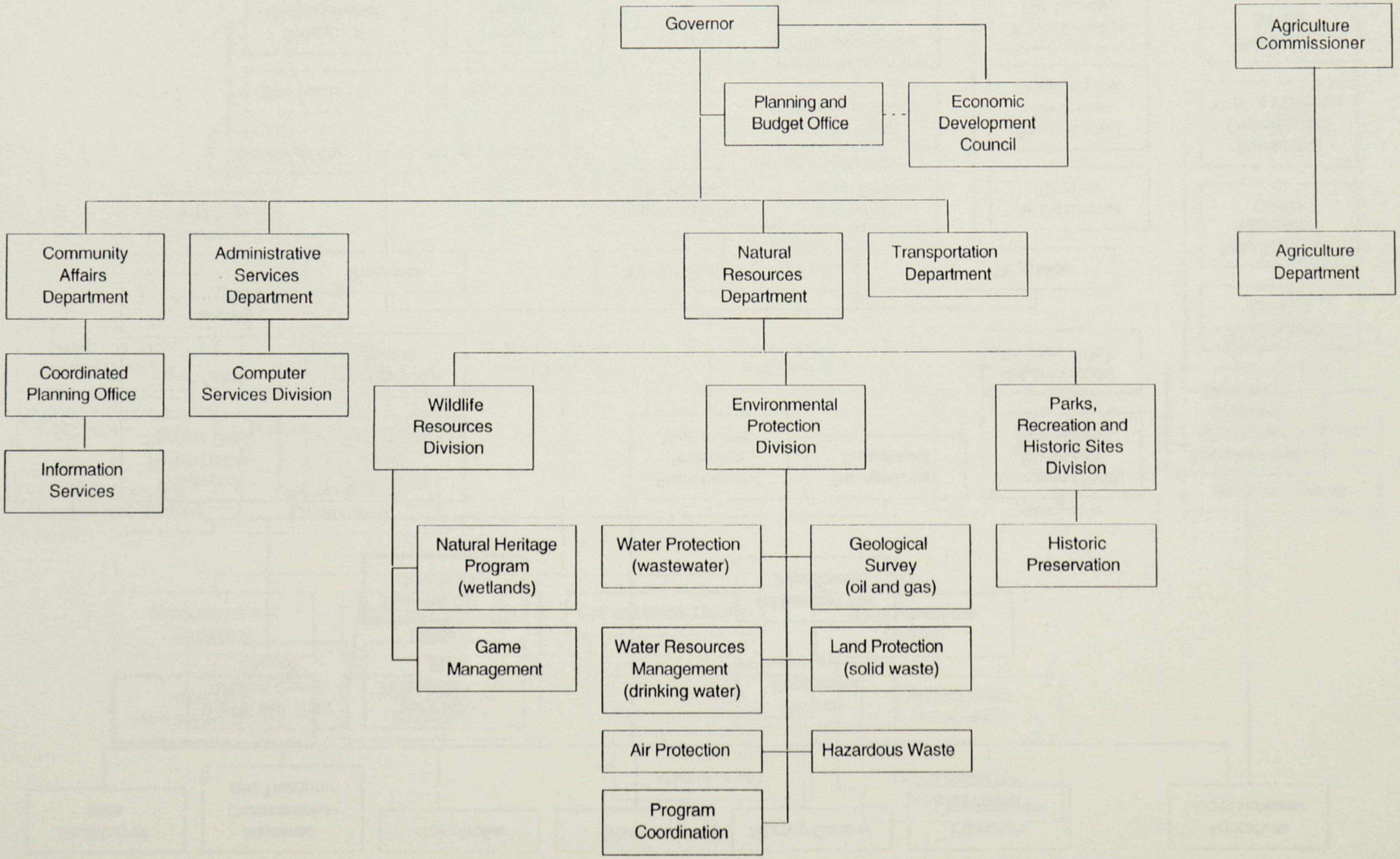
Warnecke, 1994


Secretary of State
Insurance Commissioner and Treasurer
Comptroller
Governor
Attorney General
Education Commissioner
Agriculture Commissioner
Growth Mgt. Data Network Coord. Council
Information Resources Com. Staff
Statewide GI/GIS Coordination
Revenue Department
Ad Valorem Tax Department
Health and Rehabilitative Services Dept.
Health Office
Environmental Health Programs
Environmental Epidemiology
Community Affairs Department
Emergency Mgt. Division
Environmental Protection Department*
Programs
State Lands Div.
Beaches Bureau
Survey and Mapping Bureau
Marine Res. Div.
Marine Inst. Bur.
Preserves, Research Reserves and Sanctuaries
Ecosystems
Greenways and Trails Office
Department Support Division
Information Systems Bureau
GIS (department wide coordination)
Regulation
Air Resources Division
Environmental Resource Permitting Div.
Water Facilities Div. (quality, quantity,drinking)
Transportation Department
Game and Fresh Water Fish Commission
Environmental Services Office
Agriculture and Consumer Services Department
Administration Division
Agriculture Mgt. Information Center
Agricultural Environmental Services Division
Pesticides Bureau

*Includes former Departments of Natural Resources and Environmental Regulation

Florida - GI/GIS

Georgia - GI/GIS



Governor

Planning and Budget Office

Economic Development Council

Agriculture Commissioner

Community Affairs Department

Administrative Services Department

Natural Resources Department

Transportation Department

Agriculture Department

Coordinated Planning Office

Computer Services Division

Information Services

Wildlife Resources Division

Environmental Protection Division

Parks, Recreation and Historic Sites Division

Natural Heritage Program (wetlands)

Game Management

Water Protection (wastewater)

Geological Survey (oil and gas)

Water Resources Management (drinking water)

Land Protection (solid waste)

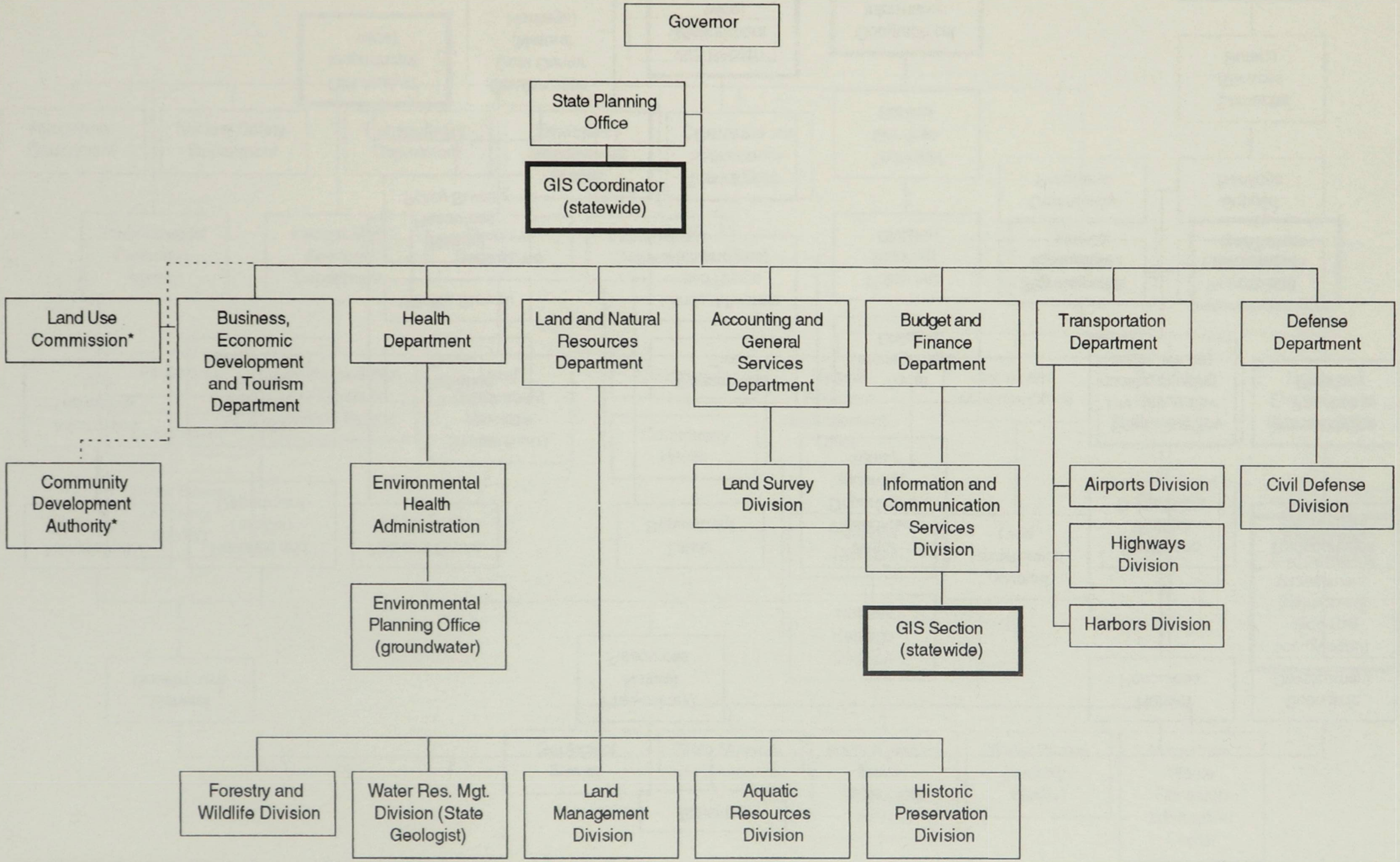
Air Protection

Hazardous Waste

Program Coordination

Historic Preservation

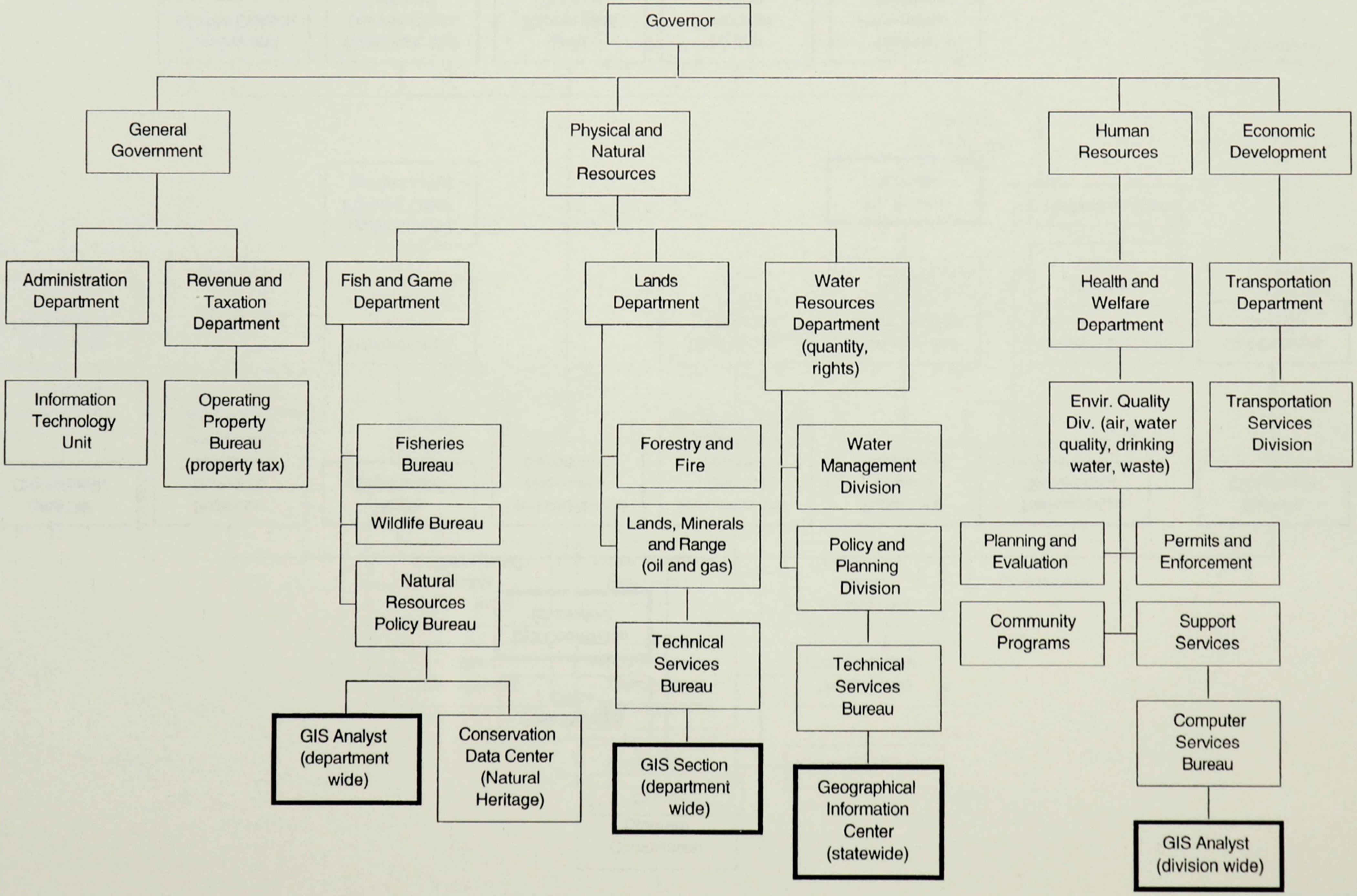
Warnecke, 1994


Governor
State Planning Office
GIS Coordinator (statewide)
Land Use Commission*
Business, Economic Development and Tourism Department
Health Department
Land and Natural Resources Department
Accounting and General Services Department
Budget and Finance Department
Transportation Department
Defense Department
Community Development Authority*
Environmental Health Administration
Environmental Planning Office (groundwater)
Land Survey Division
Information and Communication Services Division
GIS Section (statewide)
Airports Division
Highways Division
Harbors Division
Civil Defense Division
Forestry and Wildlife Division
Water Res. Mgt. Division (State Geologist)
Land Management Division
Aquatic Resources Division
Historic Preservation Division

*administratively attached to the Business, Economic Development and Tourism Department

Hawaii - GI/GIS

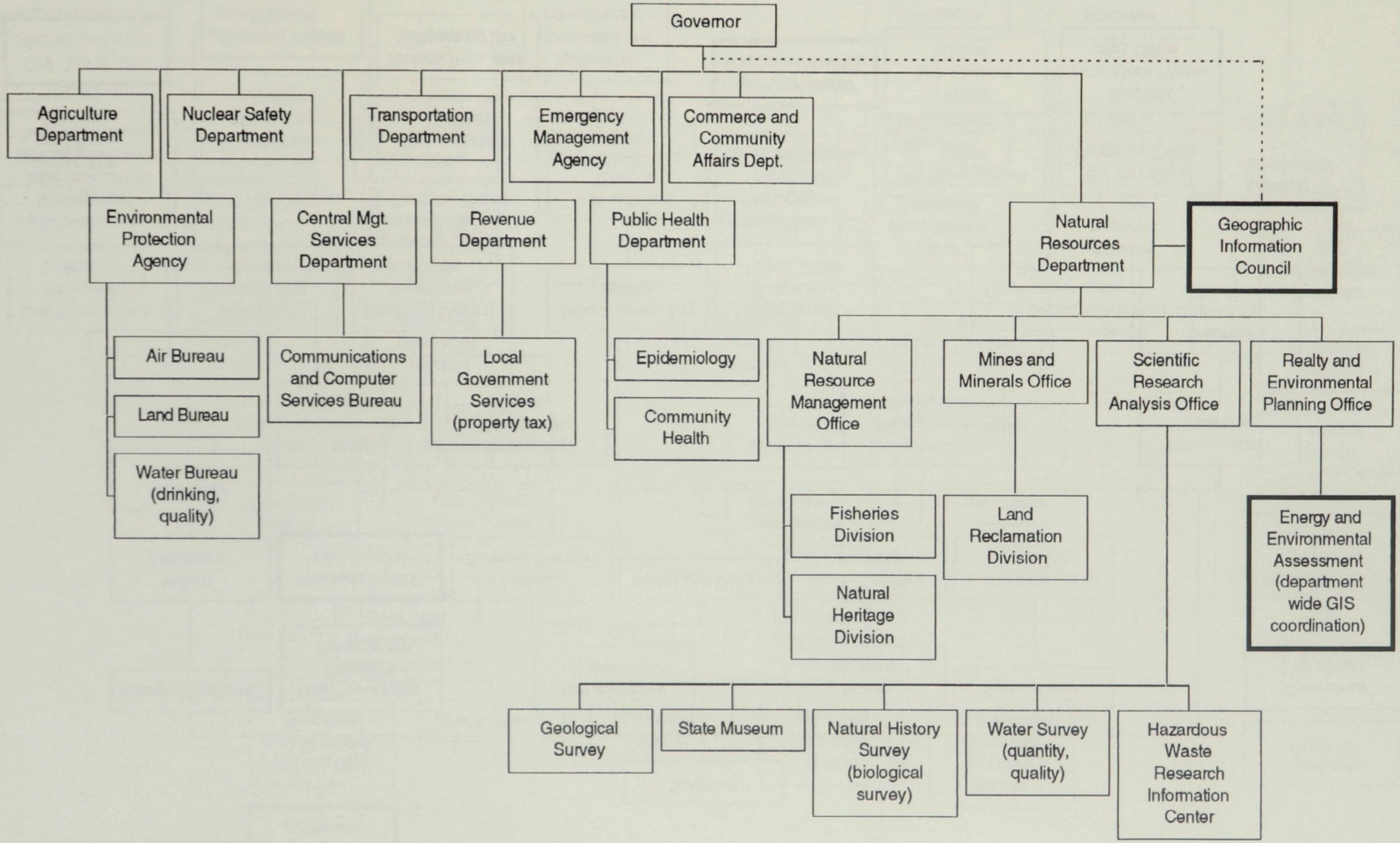
Idaho - GI/GIS



- Governor
  - General Government
    - Administration Department
      - Information Technology Unit
    - Revenue and Taxation Department
      - Operating Property Bureau (property tax)
  - Physical and Natural Resources
    - Fish and Game Department
      - Fisheries Bureau
      - Wildlife Bureau
      - Natural Resources Policy Bureau
        - **GIS Analyst (department wide)**
        - Conservation Data Center (Natural Heritage)
    - Lands Department
      - Forestry and Fire
      - Lands, Minerals and Range (oil and gas)
        - Technical Services Bureau
          - **GIS Section (department wide)**
    - Water Resources Department (quantity, rights)
      - Water Management Division
      - Policy and Planning Division
        - Technical Services Bureau
          - **Geographical Information Center (statewide)**
  - Human Resources
    - Health and Welfare Department
      - Envir. Quality Div. (air, water quality, drinking water, waste)
        - Planning and Evaluation
        - Permits and Enforcement
        - Community Programs
        - Support Services
          - Computer Services Bureau
            - **GIS Analyst (division wide)**
  - Economic Development
    - Transportation Department
      - Transportation Services Division

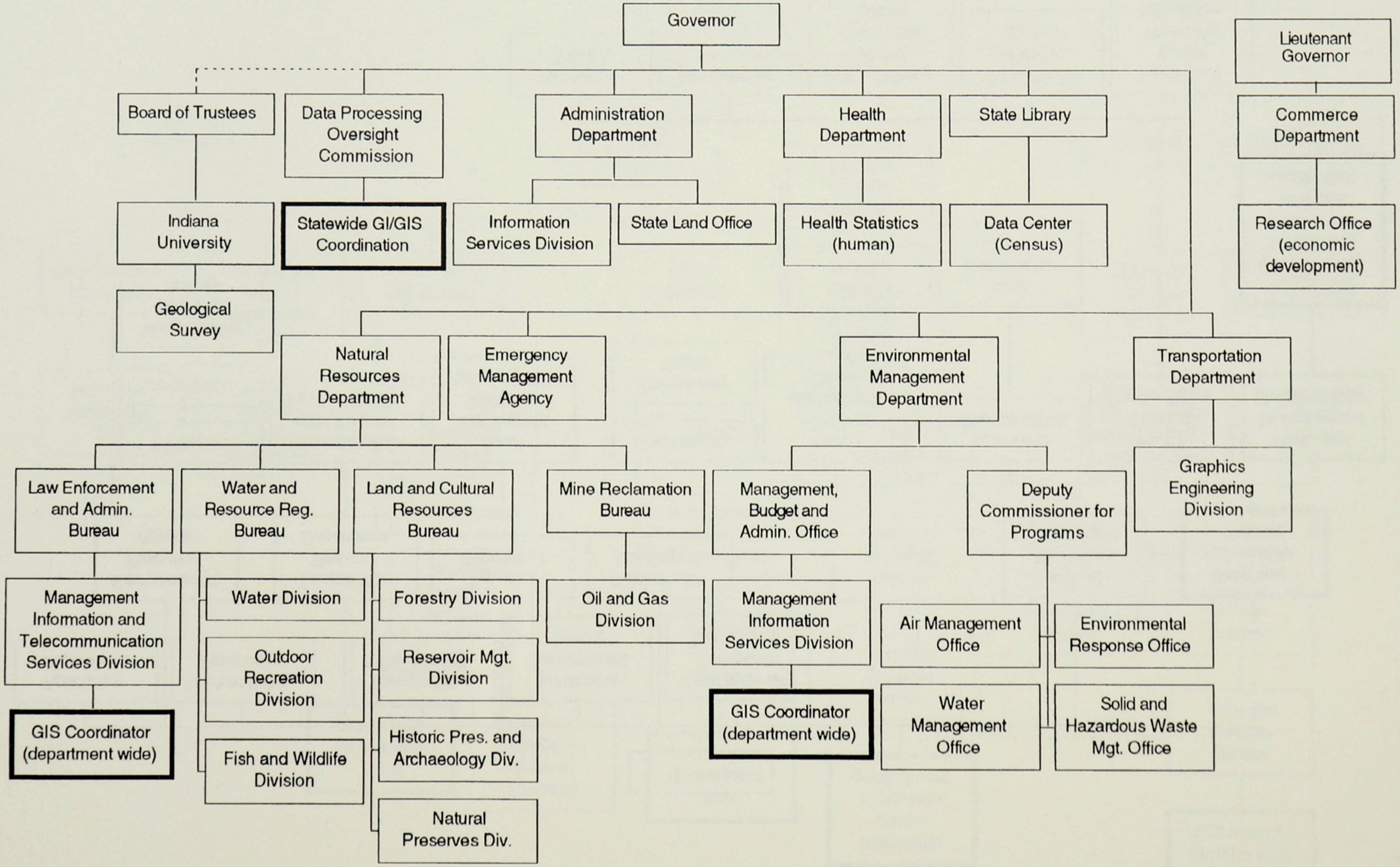
Warnecke, 1994

Warnecke, 1995


Governor
Agriculture Department
Nuclear Safety Department
Transportation Department
Emergency Management Agency
Commerce and Community Affairs Dept.
Environmental Protection Agency
Central Mgt. Services Department
Revenue Department
Public Health Department
Natural Resources Department
Geographic Information Council
Air Bureau
Land Bureau
Water Bureau (drinking, quality)
Communications and Computer Services Bureau
Local Government Services (property tax)
Epidemiology
Community Health
Natural Resource Management Office
Mines and Minerals Office
Scientific Research Analysis Office
Realty and Environmental Planning Office
Fisheries Division
Natural Heritage Division
Land Reclamation Division
Energy and Environmental Assessment (department wide GIS coordination)
Geological Survey
State Museum
Natural History Survey (biological survey)
Water Survey (quantity, quality)
Hazardous Waste Research Information Center

Illinois - GI/GIS

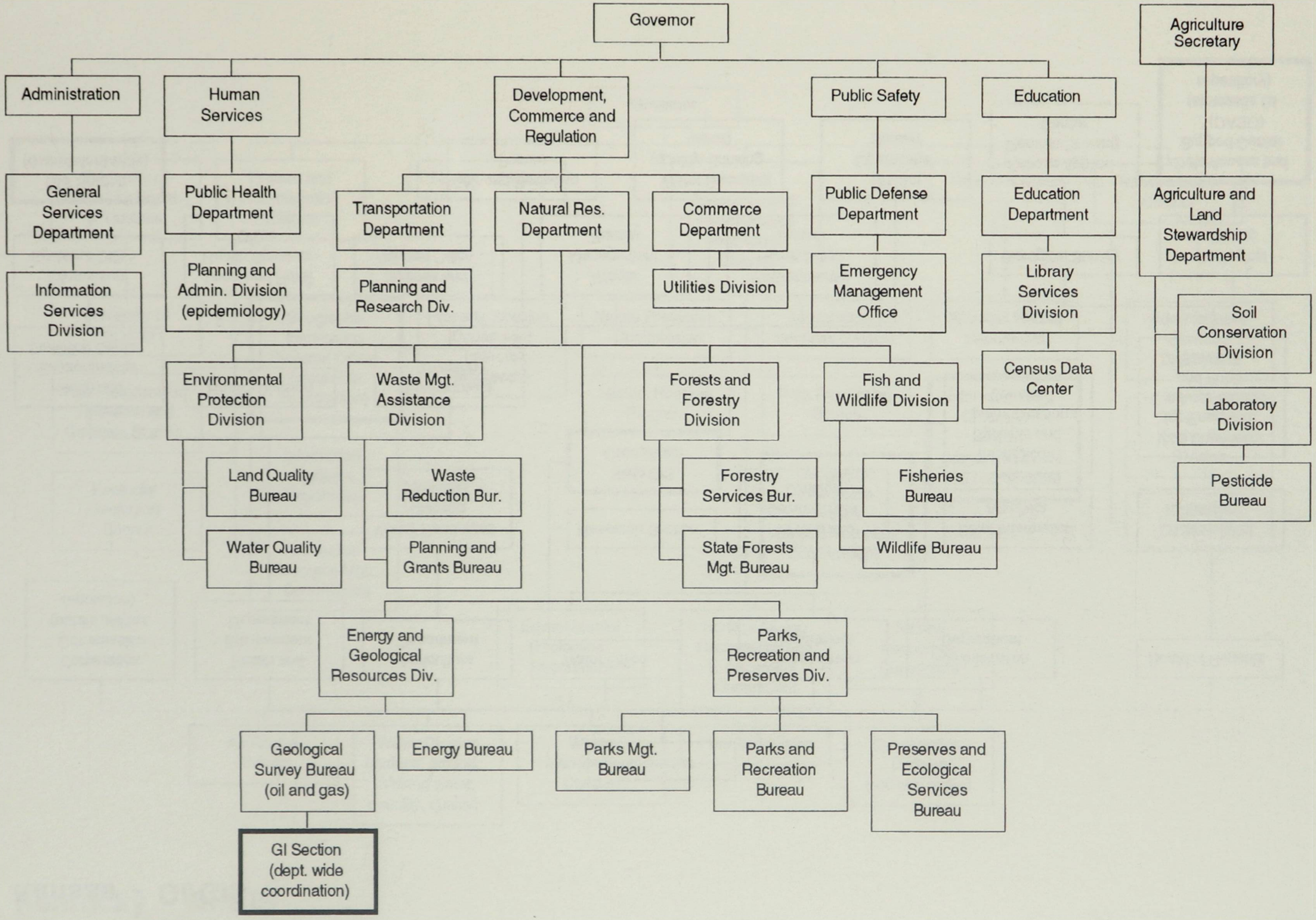
Indiana - GI/GIS



- Governor
  - Board of Trustees
    - Indiana University
      - Geological Survey
  - Data Processing Oversight Commission
    - **Statewide GI/GIS Coordination**
  - Administration Department
    - Information Services Division
    - State Land Office
  - Health Department
    - Health Statistics (human)
  - State Library
    - Data Center (Census)
  - Natural Resources Department
    - Law Enforcement and Admin. Bureau
      - Management Information and Telecommunication Services Division
        - **GIS Coordinator (department wide)**
    - Water and Resource Reg. Bureau
      - Water Division
      - Outdoor Recreation Division
      - Fish and Wildlife Division
    - Land and Cultural Resources Bureau
      - Forestry Division
      - Reservoir Mgt. Division
      - Historic Pres. and Archaeology Div.
      - Natural Preserves Div.
    - Mine Reclamation Bureau
      - Oil and Gas Division
  - Emergency Management Agency
  - Environmental Management Department
    - Management, Budget and Admin. Office
      - Management Information Services Division
        - **GIS Coordinator (department wide)**
    - Deputy Commissioner for Programs
      - Air Management Office
      - Water Management Office
      - Environmental Response Office
      - Solid and Hazardous Waste Mgt. Office
  - Transportation Department
    - Graphics Engineering Division
- Lieutenant Governor
  - Commerce Department
    - Research Office (economic development)

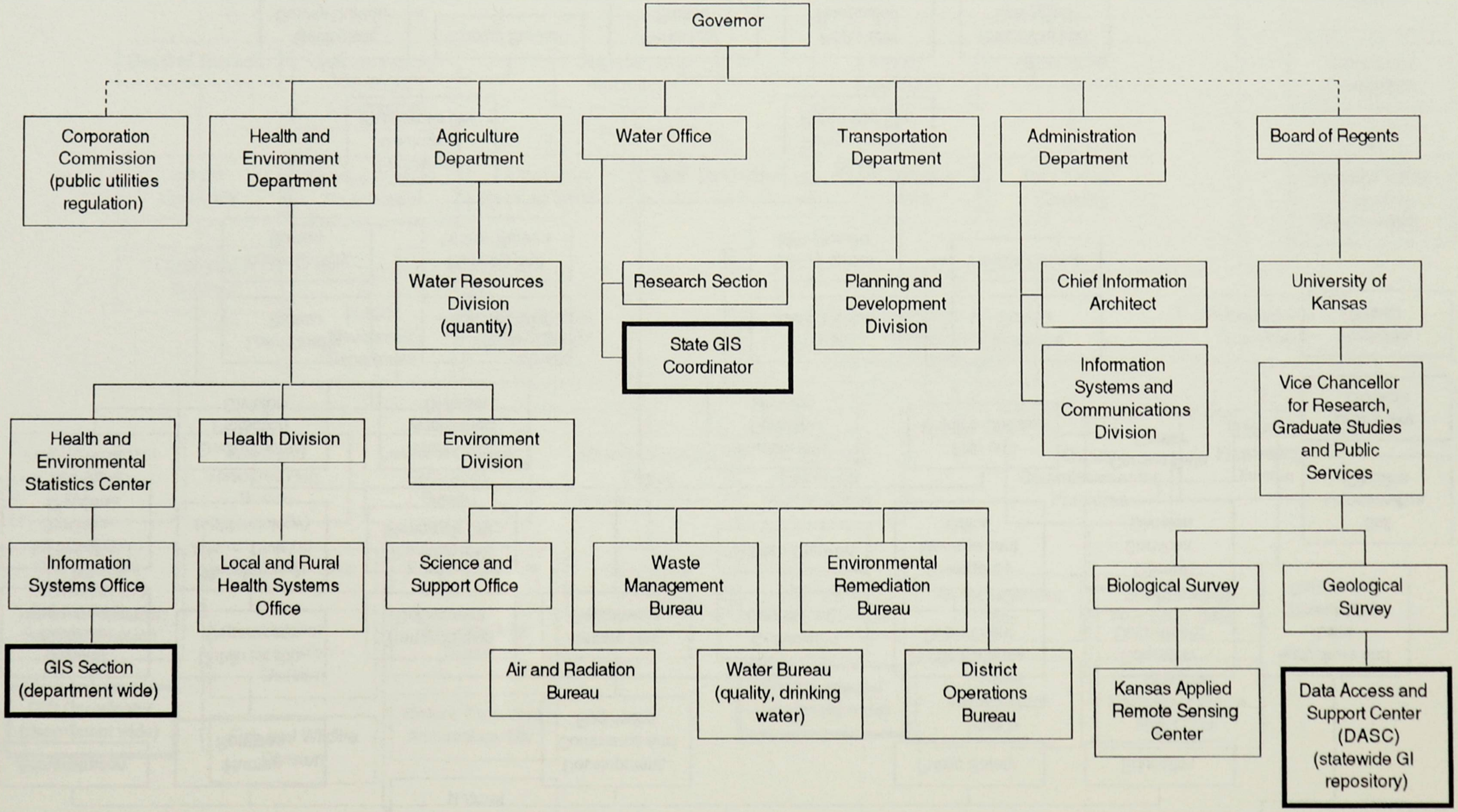
Warnecke, 1995

Warnecke, 1994


Governor
Agriculture Secretary
Administration
Human Services
Development, Commerce and Regulation
Public Safety
Education
General Services Department
Information Services Division
Public Health Department
Planning and Admin. Division (epidemiology)
Transportation Department
Planning and Research Div.
Natural Res. Department
Commerce Department
Utilities Division
Public Defense Department
Emergency Management Office
Education Department
Library Services Division
Census Data Center
Agriculture and Land Stewardship Department
Soil Conservation Division
Laboratory Division
Pesticide Bureau
Environmental Protection Division
Land Quality Bureau
Water Quality Bureau
Waste Mgt. Assistance Division
Waste Reduction Bur.
Planning and Grants Bureau
Forests and Forestry Division
Forestry Services Bur.
State Forests Mgt. Bureau
Fish and Wildlife Division
Fisheries Bureau
Wildlife Bureau
Energy and Geological Resources Div.
Geological Survey Bureau (oil and gas)
GI Section (dept. wide coordination)
Energy Bureau
Parks, Recreation and Preserves Div.
Parks Mgt. Bureau
Parks and Recreation Bureau
Preserves and Ecological Services Bureau

Iowa - GI/GIS

Kansas - GI/GIS



Governor

Corporation Commission (public utilities regulation)

Health and Environment Department

Agriculture Department

Water Office

Transportation Department

Administration Department

Board of Regents

Water Resources Division (quantity)

Research Section

State GIS Coordinator

Planning and Development Division

Chief Information Architect

Information Systems and Communications Division

University of Kansas

Vice Chancellor for Research, Graduate Studies and Public Services

Health and Environmental Statistics Center

Health Division

Environment Division

Information Systems Office

GIS Section (department wide)

Local and Rural Health Systems Office

Science and Support Office

Waste Management Bureau

Environmental Remediation Bureau

Air and Radiation Bureau

Water Bureau (quality, drinking water)

District Operations Bureau

Biological Survey

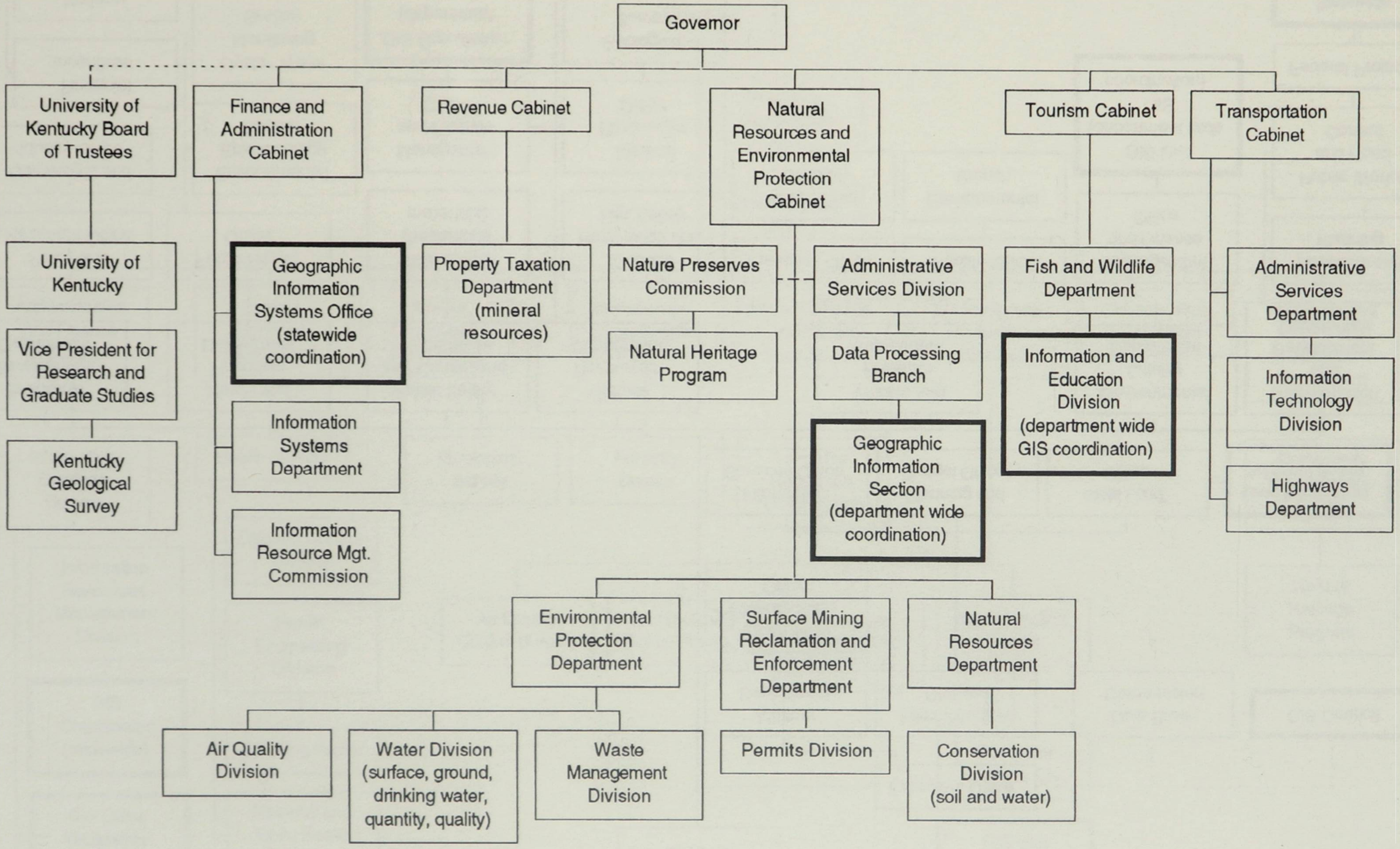
Geological Survey

Kansas Applied Remote Sensing Center

Data Access and Support Center (DASC) (statewide GI repository)

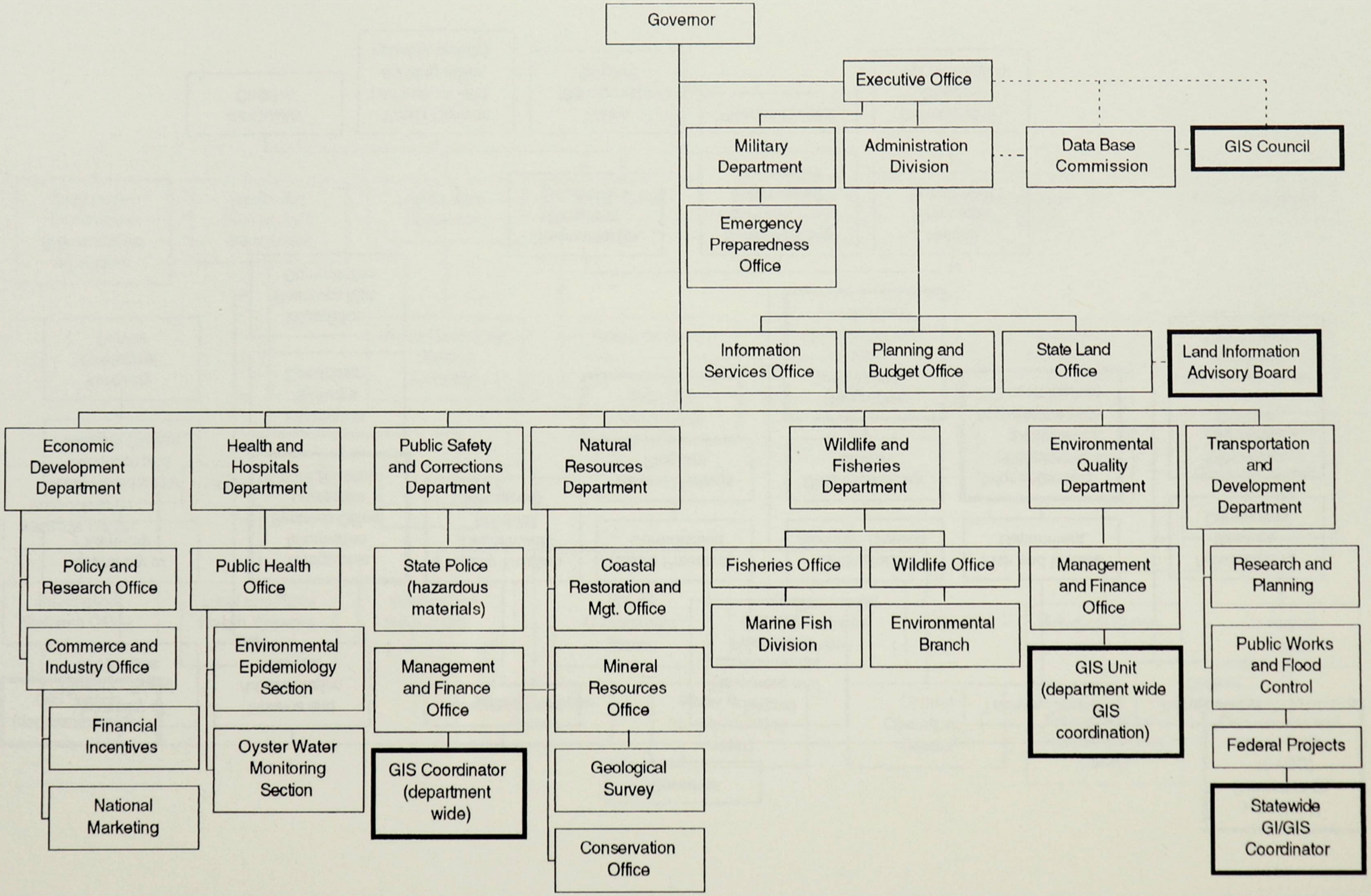
Warnecke, 1995

Warnecke, 1994


Governor
University of Kentucky Board of Trustees
Finance and Administration Cabinet
Revenue Cabinet
Natural Resources and Environmental Protection Cabinet
Tourism Cabinet
Transportation Cabinet
University of Kentucky
Vice President for Research and Graduate Studies
Kentucky Geological Survey
Geographic Information Systems Office (statewide coordination)
Information Systems Department
Information Resource Mgt. Commission
Property Taxation Department (mineral resources)
Nature Preserves Commission
Natural Heritage Program
Administrative Services Division
Data Processing Branch
Geographic Information Section (department wide coordination)
Fish and Wildlife Department
Information and Education Division (department wide GIS coordination)
Administrative Services Department
Information Technology Division
Highways Department
Environmental Protection Department
Surface Mining Reclamation and Enforcement Department
Natural Resources Department
Air Quality Division
Water Division (surface, ground, drinking water, quantity, quality)
Waste Management Division
Permits Division
Conservation Division (soil and water)

Kentucky - GI/GIS

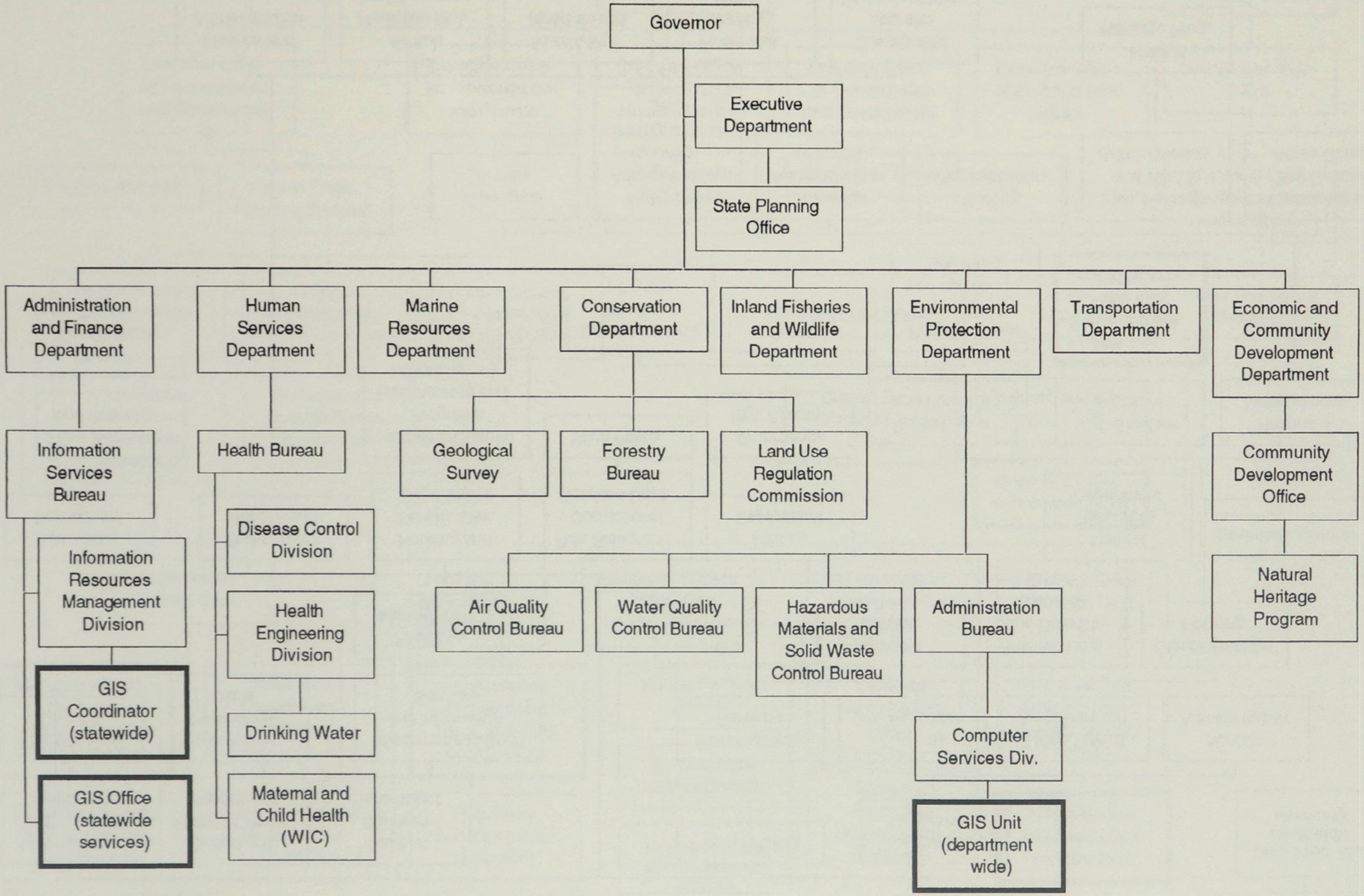
Louisiana - GI/GIS



- Governor
  - Executive Office
    - Military Department
      - Emergency Preparedness Office
    - Administration Division
      - Information Services Office
      - Planning and Budget Office
      - State Land Office
        - **Land Information Advisory Board**
    - Data Base Commission
    - **GIS Council**
  - Economic Development Department
    - Policy and Research Office
    - Commerce and Industry Office
      - Financial Incentives
      - National Marketing
  - Health and Hospitals Department
    - Public Health Office
      - Environmental Epidemiology Section
      - Oyster Water Monitoring Section
  - Public Safety and Corrections Department
    - State Police (hazardous materials)
    - Management and Finance Office
      - **GIS Coordinator (department wide)**
  - Natural Resources Department
    - Coastal Restoration and Mgt. Office
    - Mineral Resources Office
      - Geological Survey
    - Conservation Office
  - Wildlife and Fisheries Department
    - Fisheries Office
      - Marine Fish Division
    - Wildlife Office
      - Environmental Branch
  - Environmental Quality Department
    - Management and Finance Office
      - **GIS Unit (department wide GIS coordination)**
  - Transportation and Development Department
    - Research and Planning
    - Public Works and Flood Control
      - Federal Projects
        - **Statewide GI/GIS Coordinator**

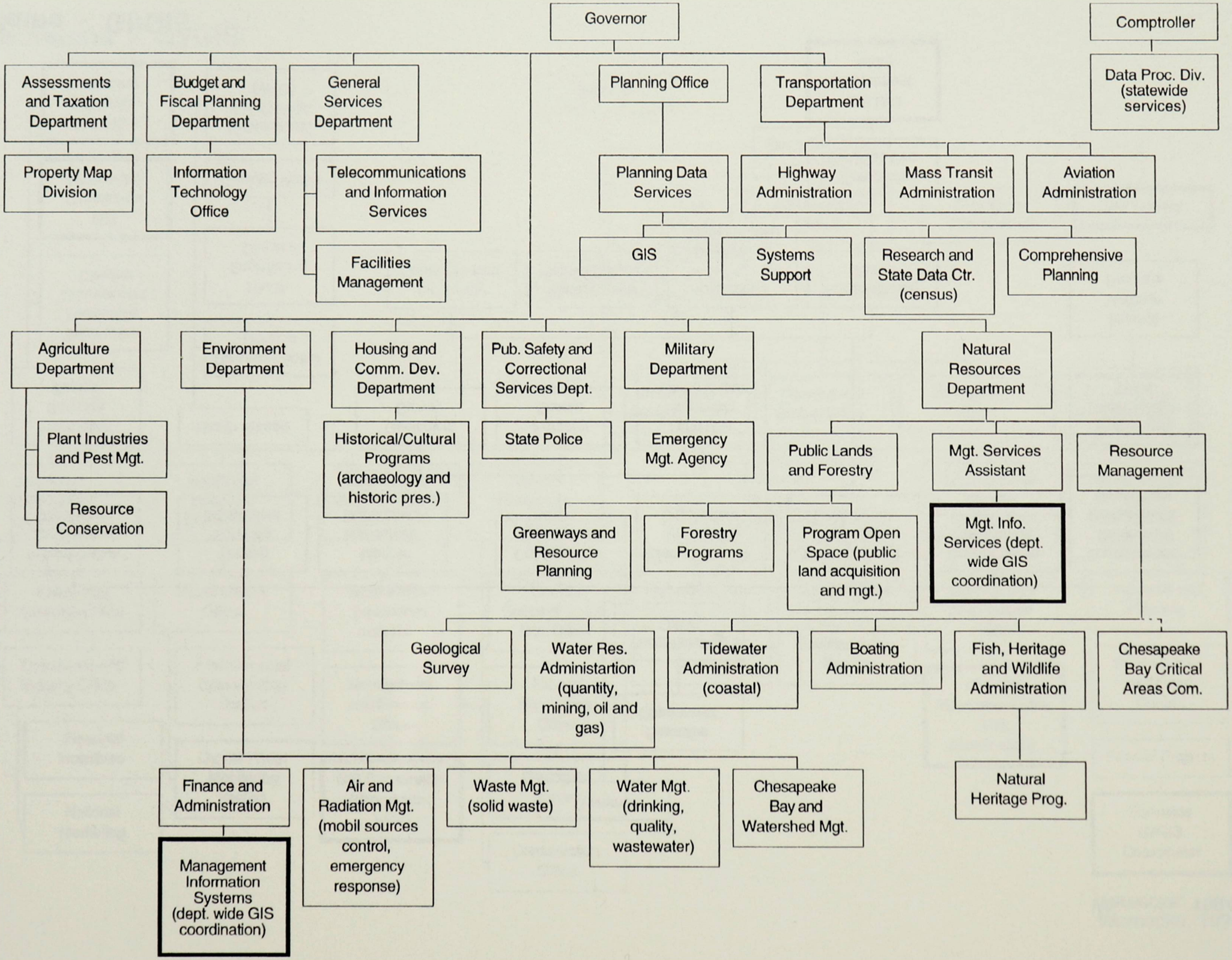
Warnecke, 1995

Warnecke, 1994


Governor
Executive Department
State Planning Office
Administration and Finance Department
Human Services Department
Marine Resources Department
Conservation Department
Inland Fisheries and Wildlife Department
Environmental Protection Department
Transportation Department
Economic and Community Development Department
Information Services Bureau
Information Resources Management Division
GIS Coordinator (statewide)
GIS Office (statewide services)
Health Bureau
Disease Control Division
Health Engineering Division
Drinking Water
Maternal and Child Health (WIC)
Geological Survey
Forestry Bureau
Land Use Regulation Commission
Air Quality Control Bureau
Water Quality Control Bureau
Hazardous Materials and Solid Waste Control Bureau
Administration Bureau
Computer Services Div.
GIS Unit (department wide)
Community Development Office
Natural Heritage Program

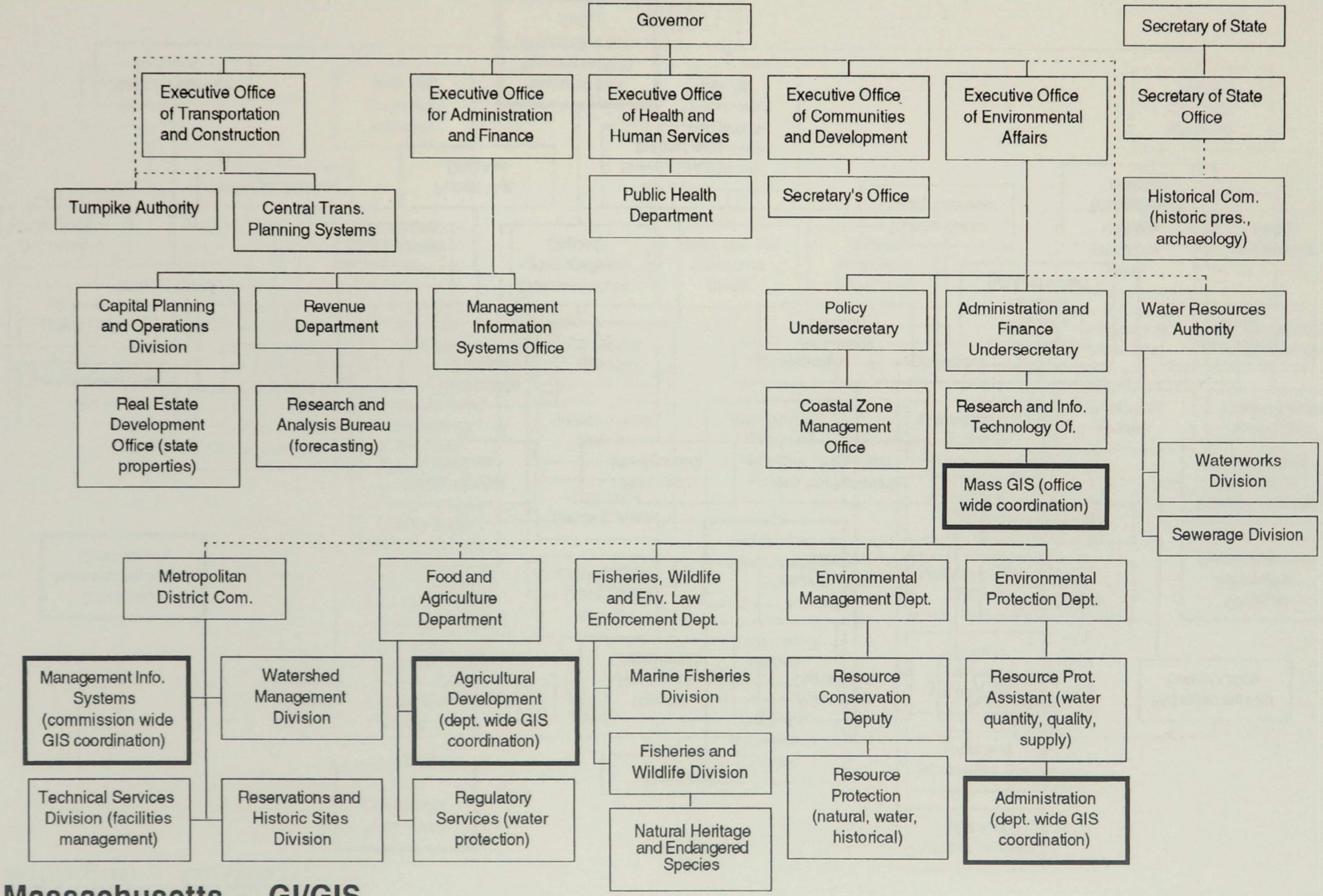
Maine - GI/GIS

Maryland - GI/GIS



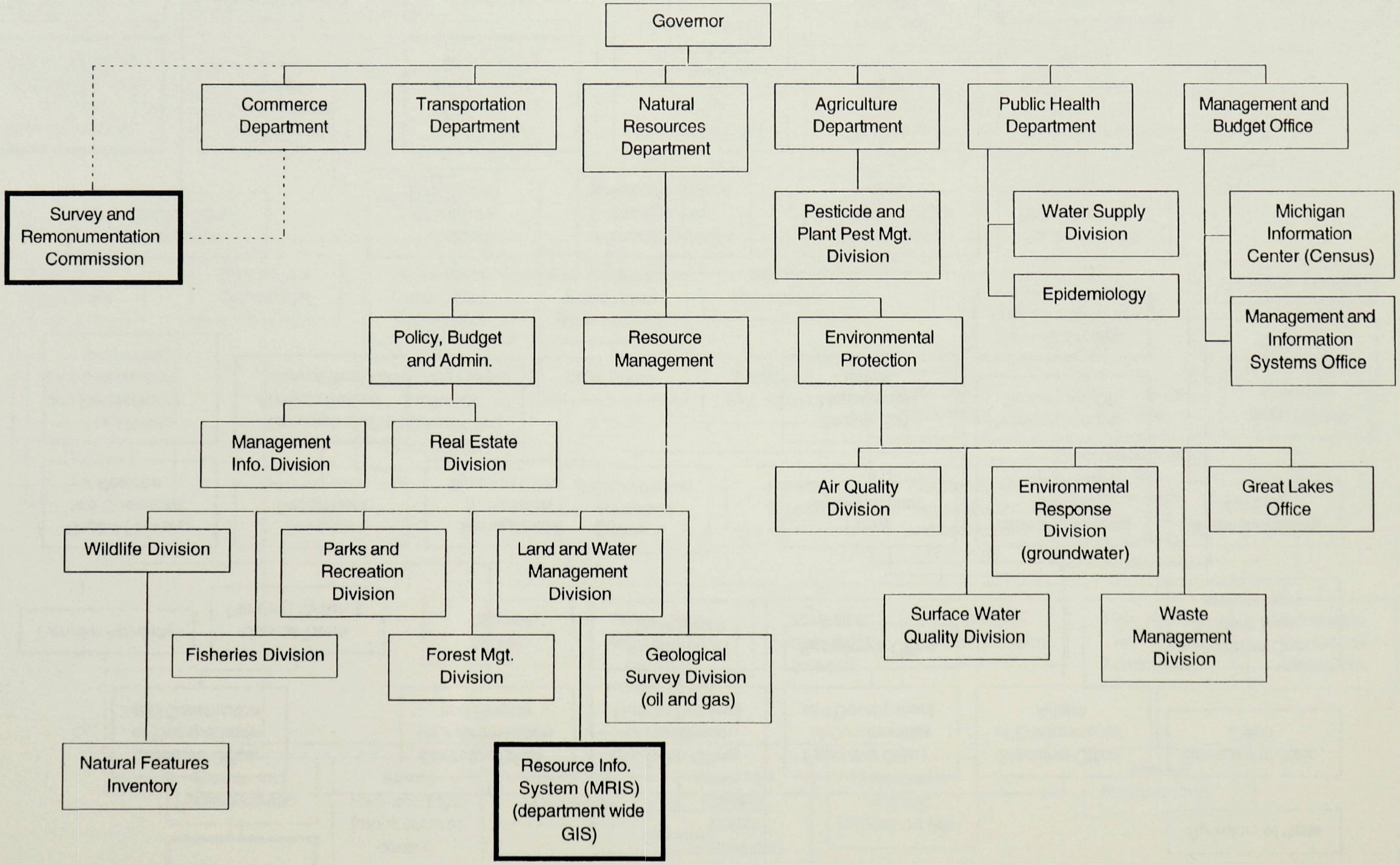
- Governor
  - Assessments and Taxation Department
    - Property Map Division
  - Budget and Fiscal Planning Department
    - Information Technology Office
  - General Services Department
    - Telecommunications and Information Services
    - Facilities Management
  - Planning Office
    - Planning Data Services
      - GIS
      - Systems Support
      - Research and State Data Ctr. (census)
      - Comprehensive Planning
  - Transportation Department
    - Highway Administration
    - Mass Transit Administration
    - Aviation Administration
  - Agriculture Department
    - Plant Industries and Pest Mgt.
    - Resource Conservation
  - Environment Department
    - Finance and Administration
      - **Management Information Systems (dept. wide GIS coordination)**
    - Air and Radiation Mgt. (mobil sources control, emergency response)
    - Waste Mgt. (solid waste)
    - Water Mgt. (drinking, quality, wastewater)
    - Chesapeake Bay and Watershed Mgt.
  - Housing and Comm. Dev. Department
    - Historical/Cultural Programs (archaeology and historic pres.)
  - Pub. Safety and Correctional Services Dept.
    - State Police
  - Military Department
    - Emergency Mgt. Agency
  - Natural Resources Department
    - Public Lands and Forestry
      - Greenways and Resource Planning
      - Forestry Programs
      - Program Open Space (public land acquisition and mgt.)
    - Mgt. Services Assistant
      - **Mgt. Info. Services (dept. wide GIS coordination)**
    - Resource Management
      - Geological Survey
      - Water Res. Administartion (quantity, mining, oil and gas)
      - Tidewater Administration (coastal)
      - Boating Administration
      - Fish, Heritage and Wildlife Administration
        - Natural Heritage Prog.
      - Chesapeake Bay Critical Areas Com.
- Comptroller
  - Data Proc. Div. (statewide services)

Warnecke, 1994


Governor
Secretary of State
Executive Office of Transportation and Construction
Executive Office for Administration and Finance
Executive Office of Health and Human Services
Executive Office of Communities and Development
Executive Office of Environmental Affairs
Secretary of State Office
Turnpike Authority
Central Trans. Planning Systems
Public Health Department
Secretary's Office
Historical Com. (historic pres., archaeology)
Capital Planning and Operations Division
Revenue Department
Management Information Systems Office
Policy Undersecretary
Administration and Finance Undersecretary
Water Resources Authority
Real Estate Development Office (state properties)
Research and Analysis Bureau (forecasting)
Coastal Zone Management Office
Research and Info. Technology Of.
Mass GIS (office wide coordination)
Waterworks Division
Sewerage Division
Metropolitan District Com.
Food and Agriculture Department
Fisheries, Wildlife and Env. Law Enforcement Dept.
Environmental Management Dept.
Environmental Protection Dept.
Management Info. Systems (commission wide GIS coordination)
Watershed Management Division
Agricultural Development (dept. wide GIS coordination)
Marine Fisheries Division
Resource Conservation Deputy
Resource Prot. Assistant (water quantity, quality, supply)
Fisheries and Wildlife Division
Technical Services Division (facilities management)
Reservations and Historic Sites Division
Regulatory Services (water protection)
Resource Protection (natural, water, historical)
Administration (dept. wide GIS coordination)
Natural Heritage and Endangered Species

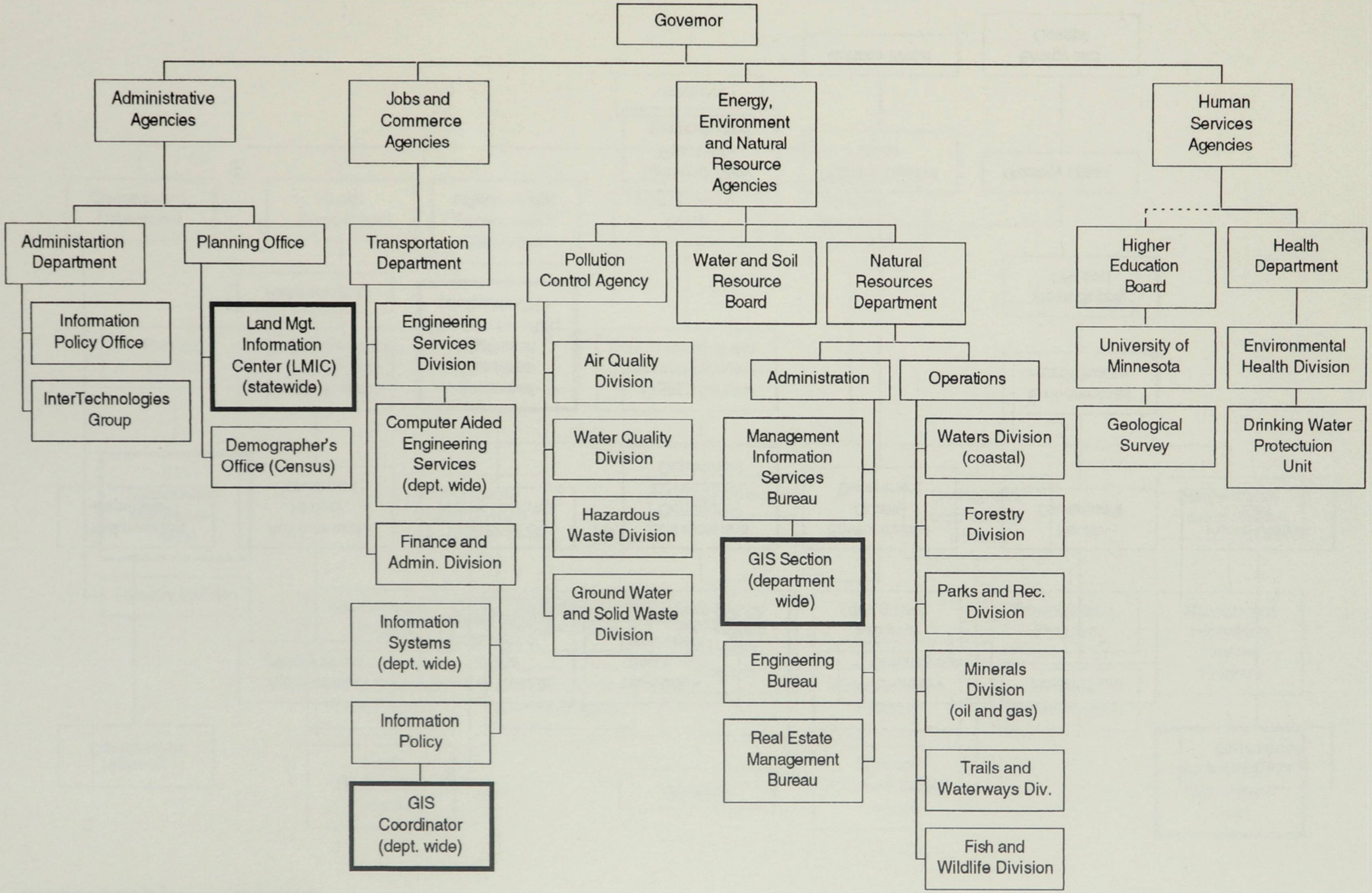
Massachusetts - GI/GIS

Michigan - GI/GIS



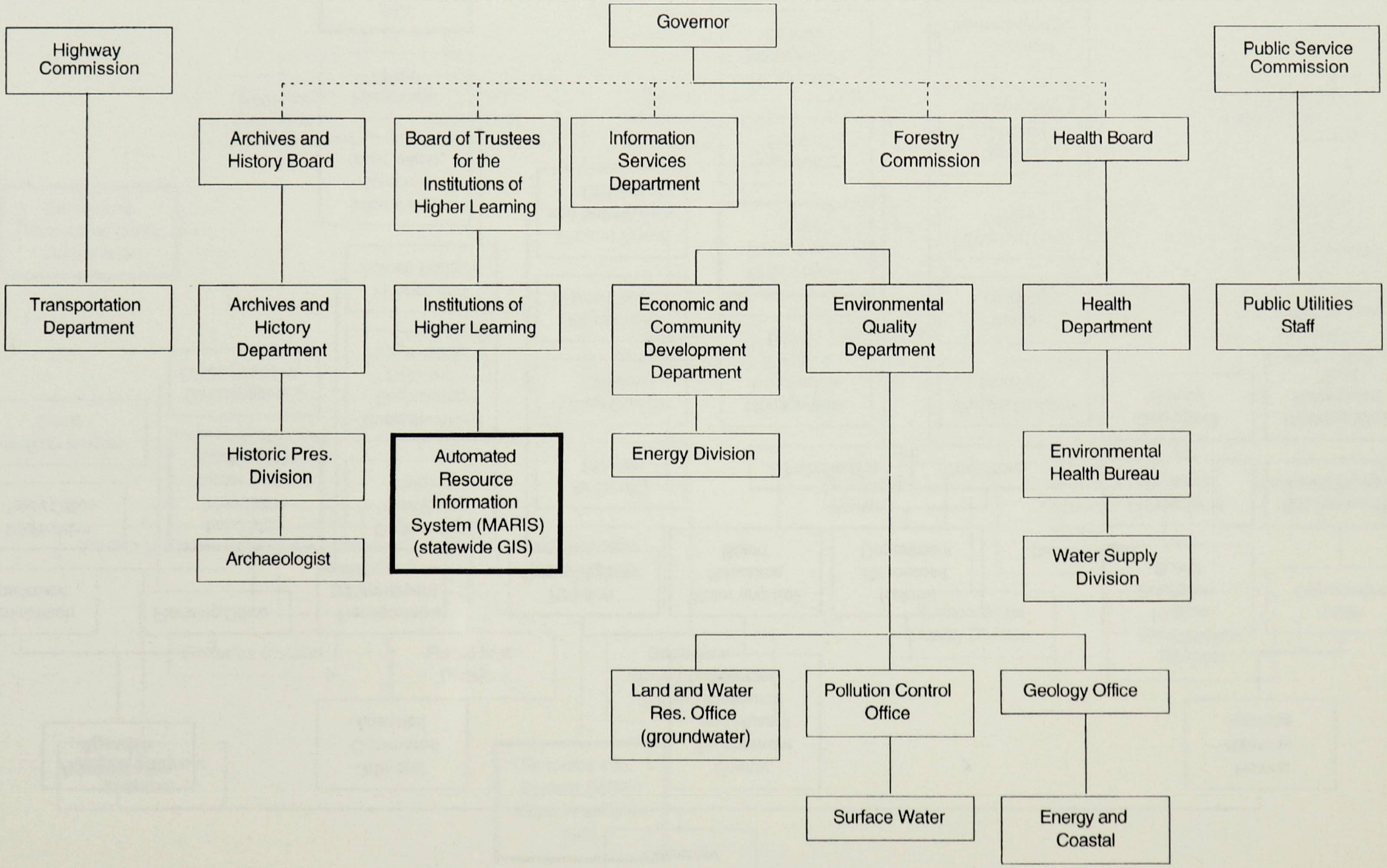
- Governor
  - Commerce Department
    - Survey and Remonumentation Commission
  - Transportation Department
  - Natural Resources Department
    - Policy, Budget and Admin.
      - Management Info. Division
      - Real Estate Division
    - Resource Management
      - Wildlife Division
        - Natural Features Inventory
      - Fisheries Division
      - Parks and Recreation Division
      - Forest Mgt. Division
      - Land and Water Management Division
        - Resource Info. System (MRIS) (department wide GIS)
      - Geological Survey Division (oil and gas)
    - Environmental Protection
      - Air Quality Division
      - Surface Water Quality Division
      - Environmental Response Division (groundwater)
      - Waste Management Division
      - Great Lakes Office
  - Agriculture Department
    - Pesticide and Plant Pest Mgt. Division
  - Public Health Department
    - Water Supply Division
    - Epidemiology
  - Management and Budget Office
    - Michigan Information Center (Census)
    - Management and Information Systems Office

Warnecke, 1994


Governor
Administrative Agencies
Jobs and Commerce Agencies
Energy, Environment and Natural Resource Agencies
Human Services Agencies
Administartion Department
Planning Office
Transportation Department
Pollution Control Agency
Water and Soil Resource Board
Natural Resources Department
Higher Education Board
Health Department
Information Policy Office
InterTechnologies Group
Land Mgt. Information Center (LMIC) (statewide)
Demographer's Office (Census)
Engineering Services Division
Computer Aided Engineering Services (dept. wide)
Finance and Admin. Division
Information Systems (dept. wide)
Information Policy
GIS Coordinator (dept. wide)
Air Quality Division
Water Quality Division
Hazardous Waste Division
Ground Water and Solid Waste Division
Administration
Operations
Management Information Services Bureau
GIS Section (department wide)
Engineering Bureau
Real Estate Management Bureau
Waters Division (coastal)
Forestry Division
Parks and Rec. Division
Minerals Division (oil and gas)
Trails and Waterways Div.
Fish and Wildlife Division
University of Minnesota
Geological Survey
Environmental Health Division
Drinking Water Protectuion Unit

Minnesota - GI/GIS

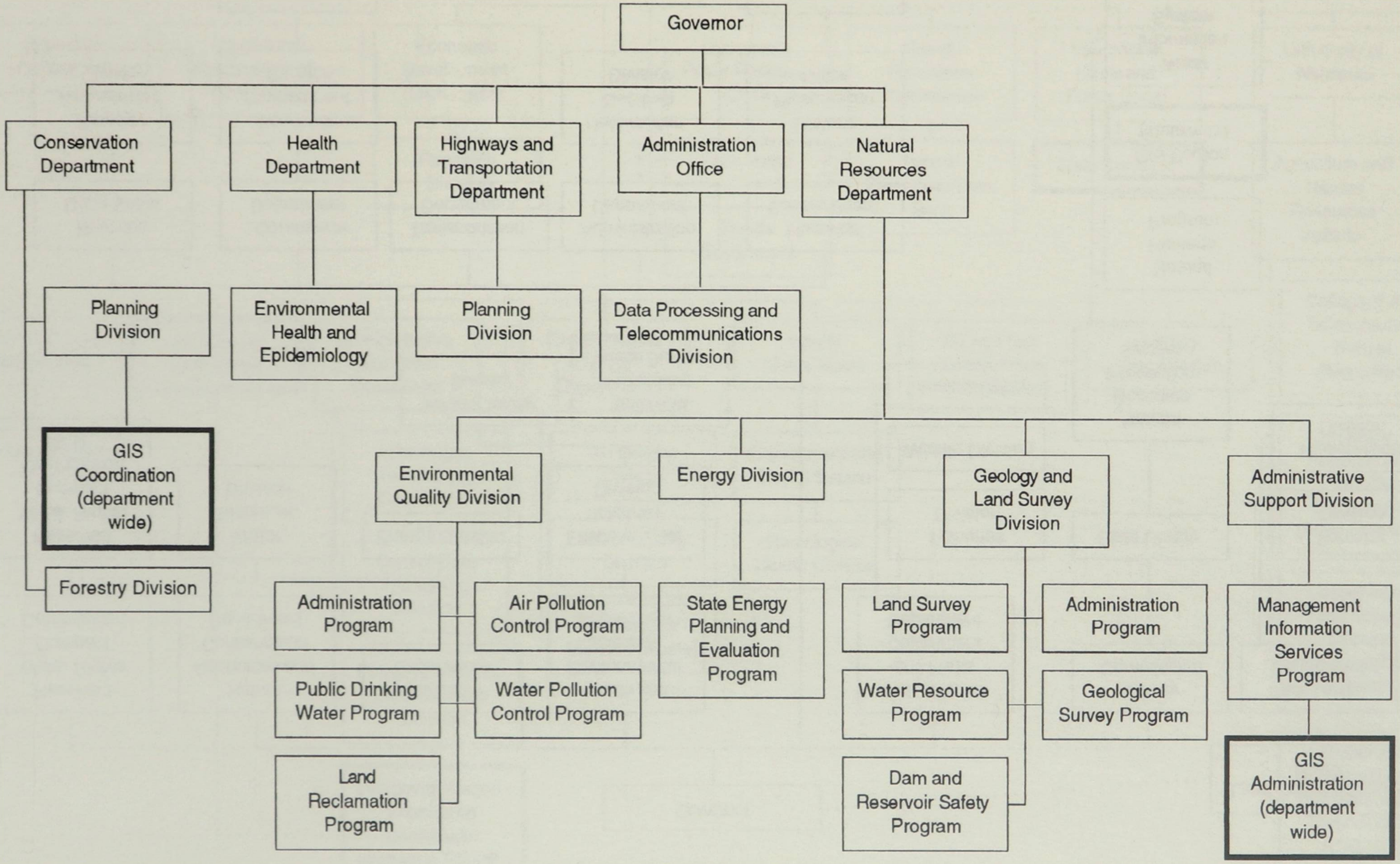
Mississippi - GI/GIS



- Highway Commission
  - Transportation Department
- Governor
  - Archives and History Board
    - Archives and Hictory Department
      - Historic Pres. Division
        - Archaeologist
  - Board of Trustees for the Institutions of Higher Learning
    - Institutions of Higher Learning
      - Automated Resource Information System (MARIS) (statewide GIS)
  - Information Services Department
  - Economic and Community Development Department
    - Energy Division
  - Environmental Quality Department
    - Land and Water Res. Office (groundwater)
    - Pollution Control Office
      - Surface Water
    - Geology Office
      - Energy and Coastal
  - Forestry Commission
  - Health Board
    - Health Department
      - Environmental Health Bureau
        - Water Supply Division
- Public Service Commission
  - Public Utilities Staff

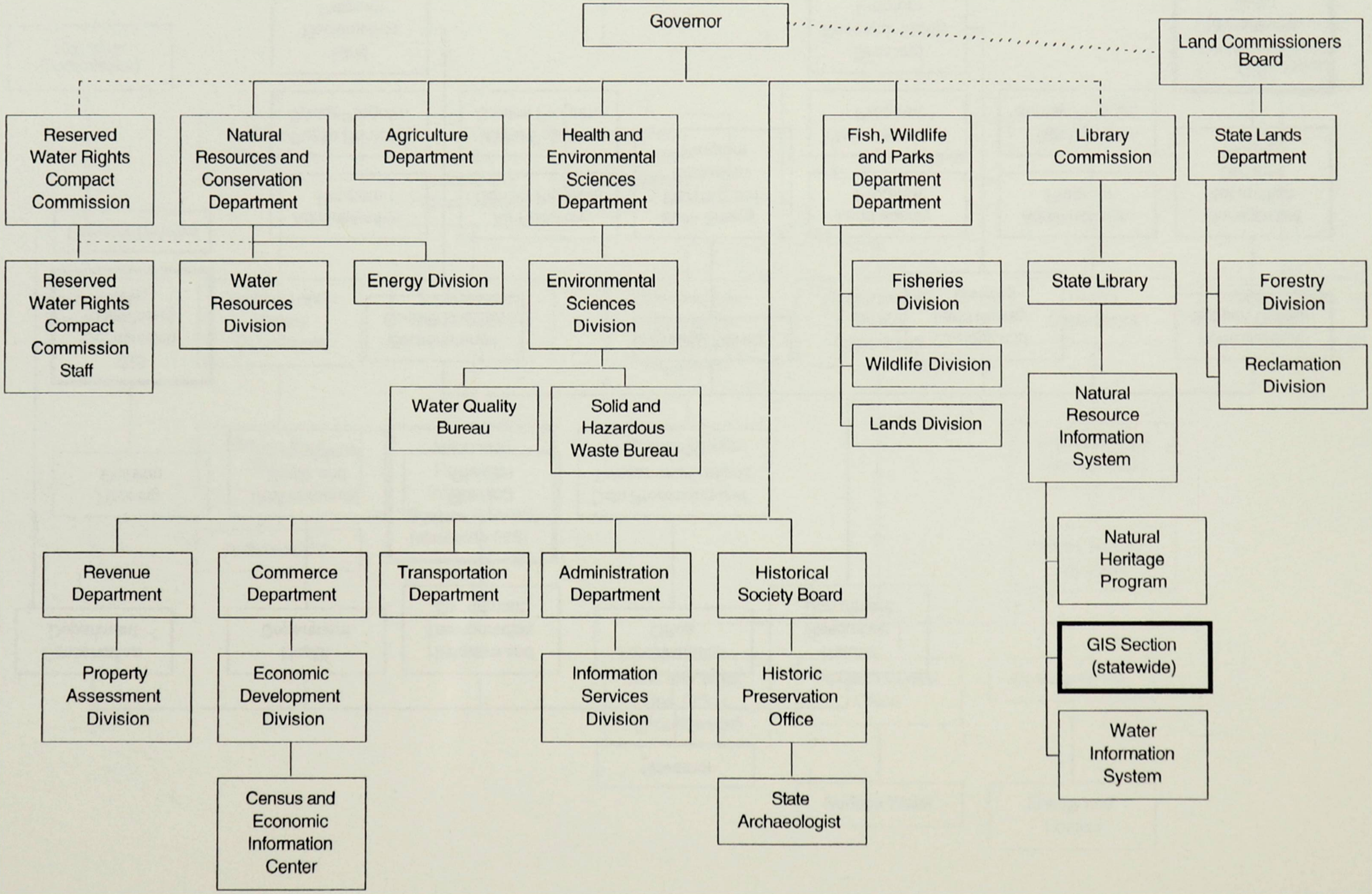
Warnecke, 1994

Warnecke, 1995


Governor
Conservation Department
Health Department
Highways and Transportation Department
Administration Office
Natural Resources Department
Planning Division
GIS Coordination (department wide)
Forestry Division
Environmental Health and Epidemiology
Planning Division
Data Processing and Telecommunications Division
Environmental Quality Division
Administration Program
Air Pollution Control Program
Public Drinking Water Program
Water Pollution Control Program
Land Reclamation Program
Energy Division
State Energy Planning and Evaluation Program
Geology and Land Survey Division
Land Survey Program
Administration Program
Water Resource Program
Geological Survey Program
Dam and Reservoir Safety Program
Administrative Support Division
Management Information Services Program
GIS Administration (department wide)

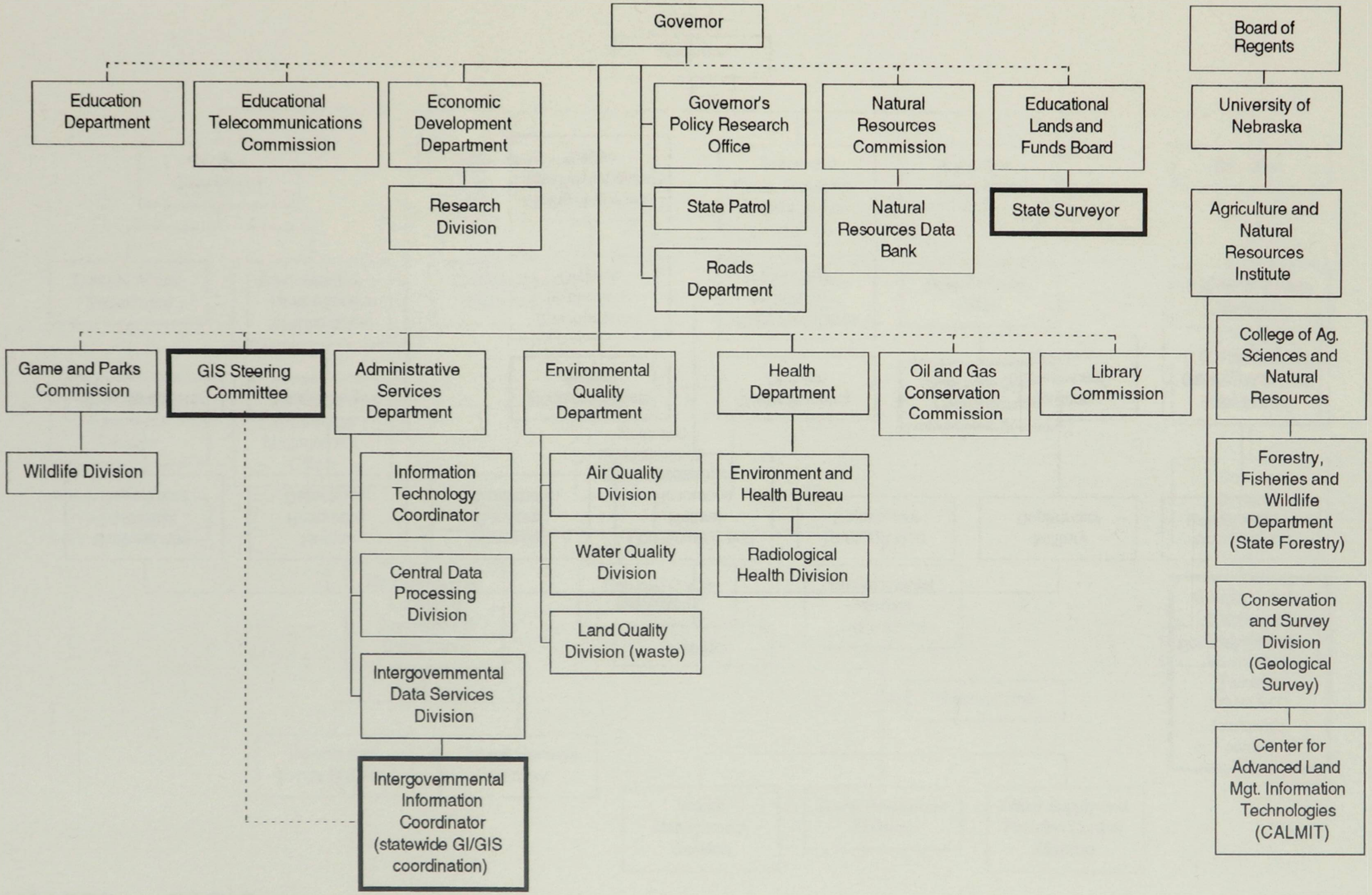
Missouri - GI/GIS

Montana - GI/GIS


Governor
Land Commissioners Board
Reserved Water Rights Compact Commission
Natural Resources and Conservation Department
Agriculture Department
Health and Environmental Sciences Department
Fish, Wildlife and Parks Department Department
Library Commission
State Lands Department
Reserved Water Rights Compact Commission Staff
Water Resources Division
Energy Division
Environmental Sciences Division
Water Quality Bureau
Solid and Hazardous Waste Bureau
Fisheries Division
Wildlife Division
Lands Division
State Library
Natural Resource Information System
Forestry Division
Reclamation Division
Natural Heritage Program
GIS Section (statewide)
Water Information System
Revenue Department
Commerce Department
Transportation Department
Administration Department
Historical Society Board
Property Assessment Division
Economic Development Division
Census and Economic Information Center
Information Services Division
Historic Preservation Office
State Archaeologist

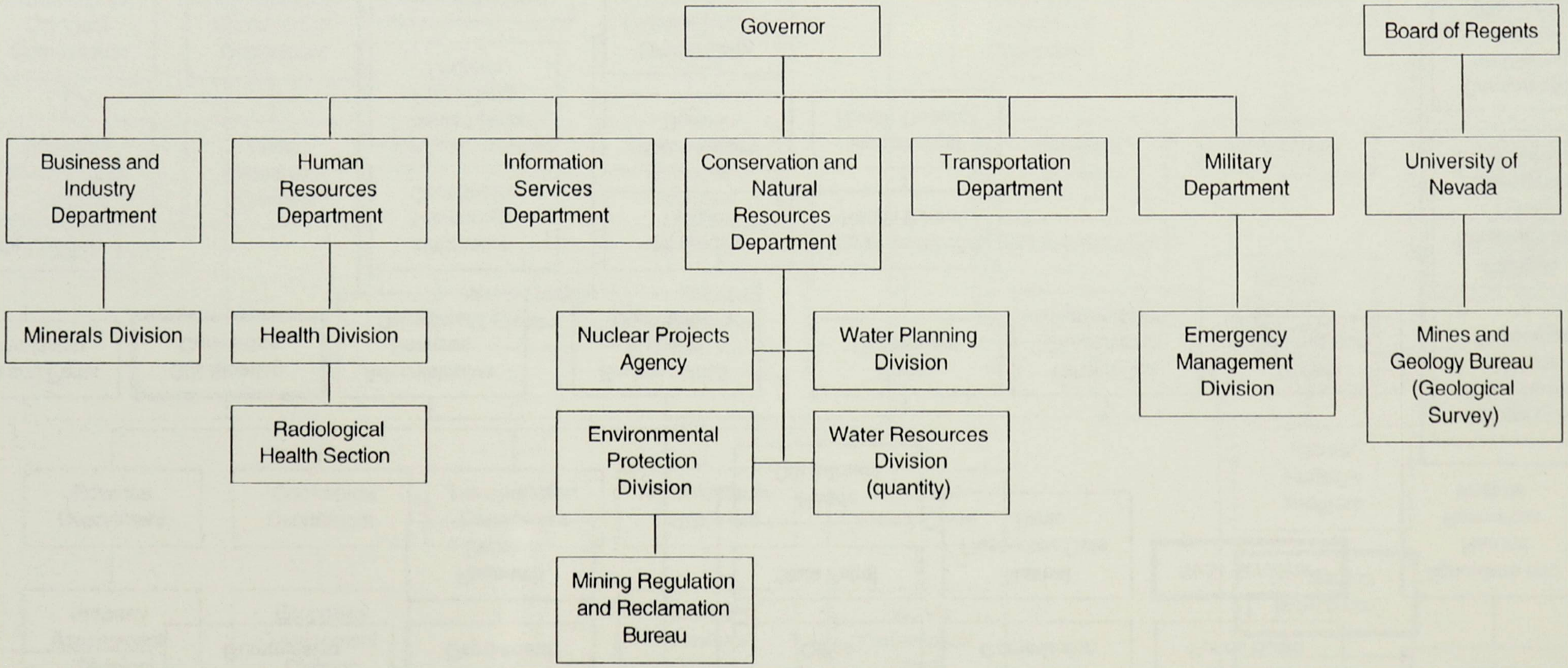
Warnecke, 1994

Warnecke, 1995


Governor
Education Department
Educational Telecommunications Commission
Economic Development Department
Research Division
Governor's Policy Research Office
State Patrol
Roads Department
Natural Resources Commission
Natural Resources Data Bank
Educational Lands and Funds Board
State Surveyor
Board of Regents
University of Nebraska
Agriculture and Natural Resources Institute
College of Ag. Sciences and Natural Resources
Forestry, Fisheries and Wildlife Department (State Forestry)
Conservation and Survey Division (Geological Survey)
Center for Advanced Land Mgt. Information Technologies (CALMIT)
Game and Parks Commission
Wildlife Division
GIS Steering Committee
Administrative Services Department
Information Technology Coordinator
Central Data Processing Division
Intergovernmental Data Services Division
Intergovernmental Information Coordinator (statewide GI/GIS coordination)
Environmental Quality Department
Air Quality Division
Water Quality Division
Land Quality Division (waste)
Health Department
Environment and Health Bureau
Radiological Health Division
Oil and Gas Conservation Commission
Library Commission

Nebraska - GI/GIS

Nevada - GI/GIS



Governor

Board of Regents

Business and Industry Department

Human Resources Department

Information Services Department

Conservation and Natural Resources Department

Transportation Department

Military Department

University of Nevada

Minerals Division

Health Division

Radiological Health Section

Nuclear Projects Agency

Water Planning Division

Environmental Protection Division

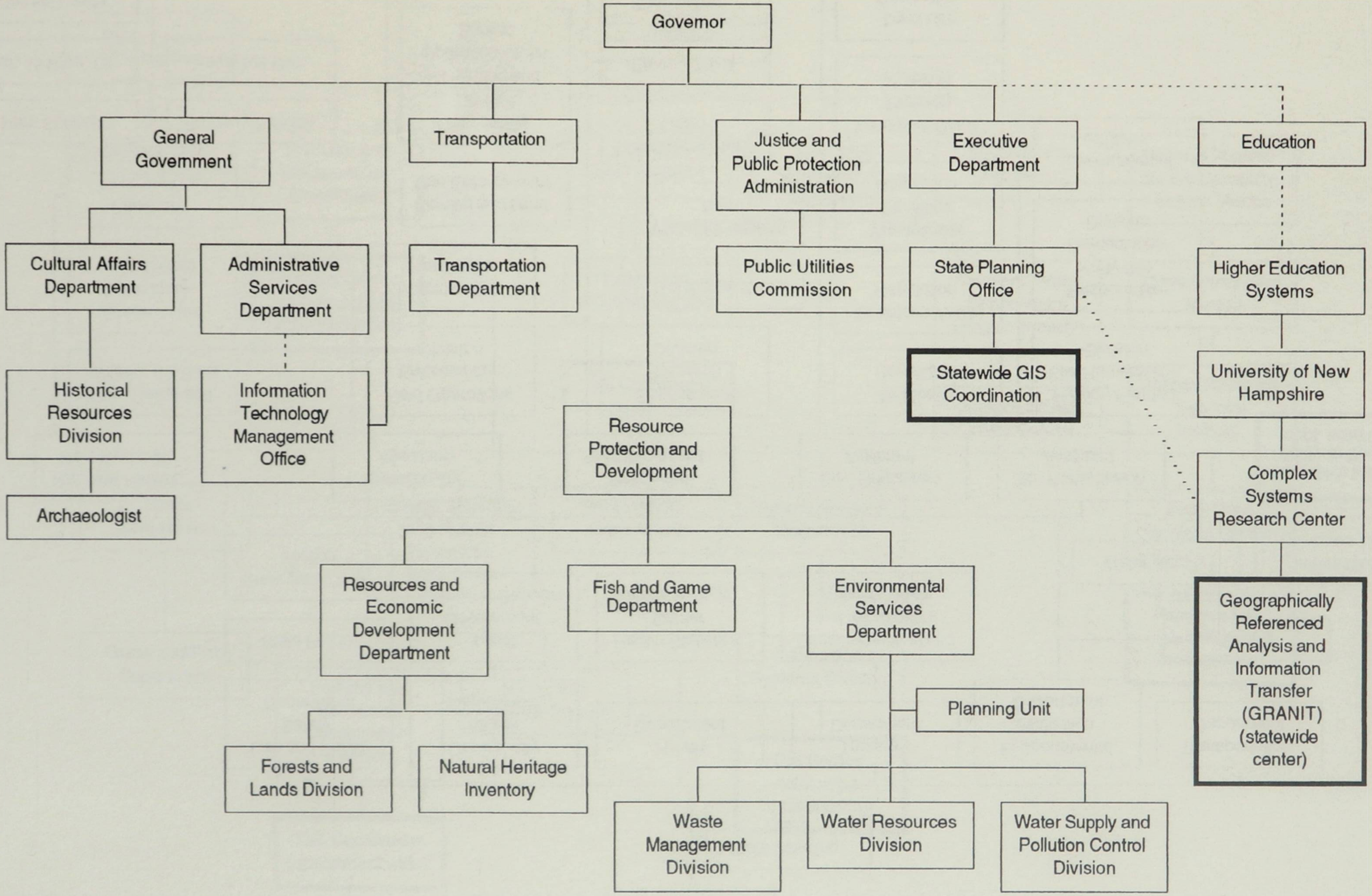
Water Resources Division (quantity)

Mining Regulation and Reclamation Bureau

Emergency Management Division

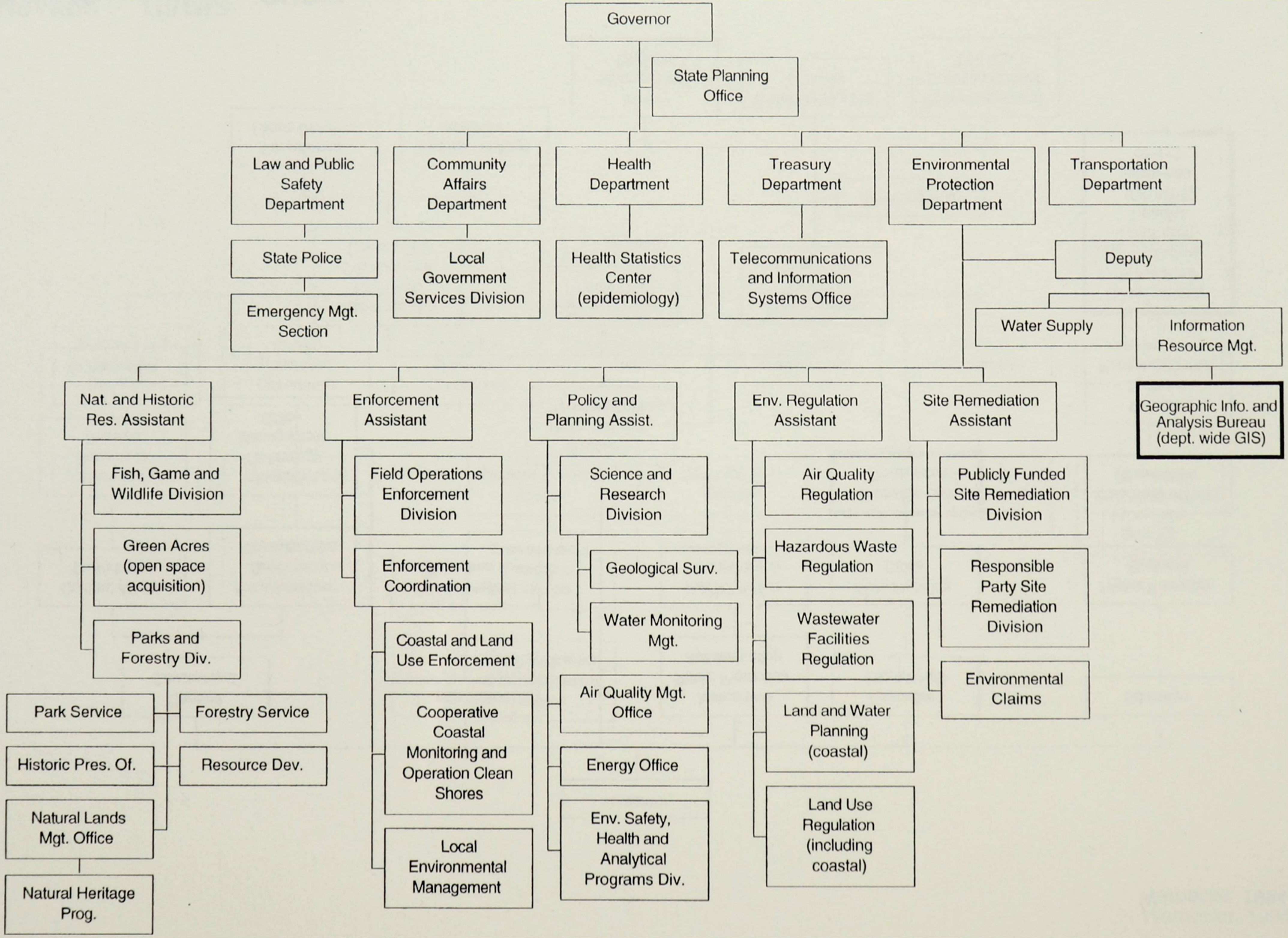
Mines and Geology Bureau (Geological Survey)

Warnecke, 1994

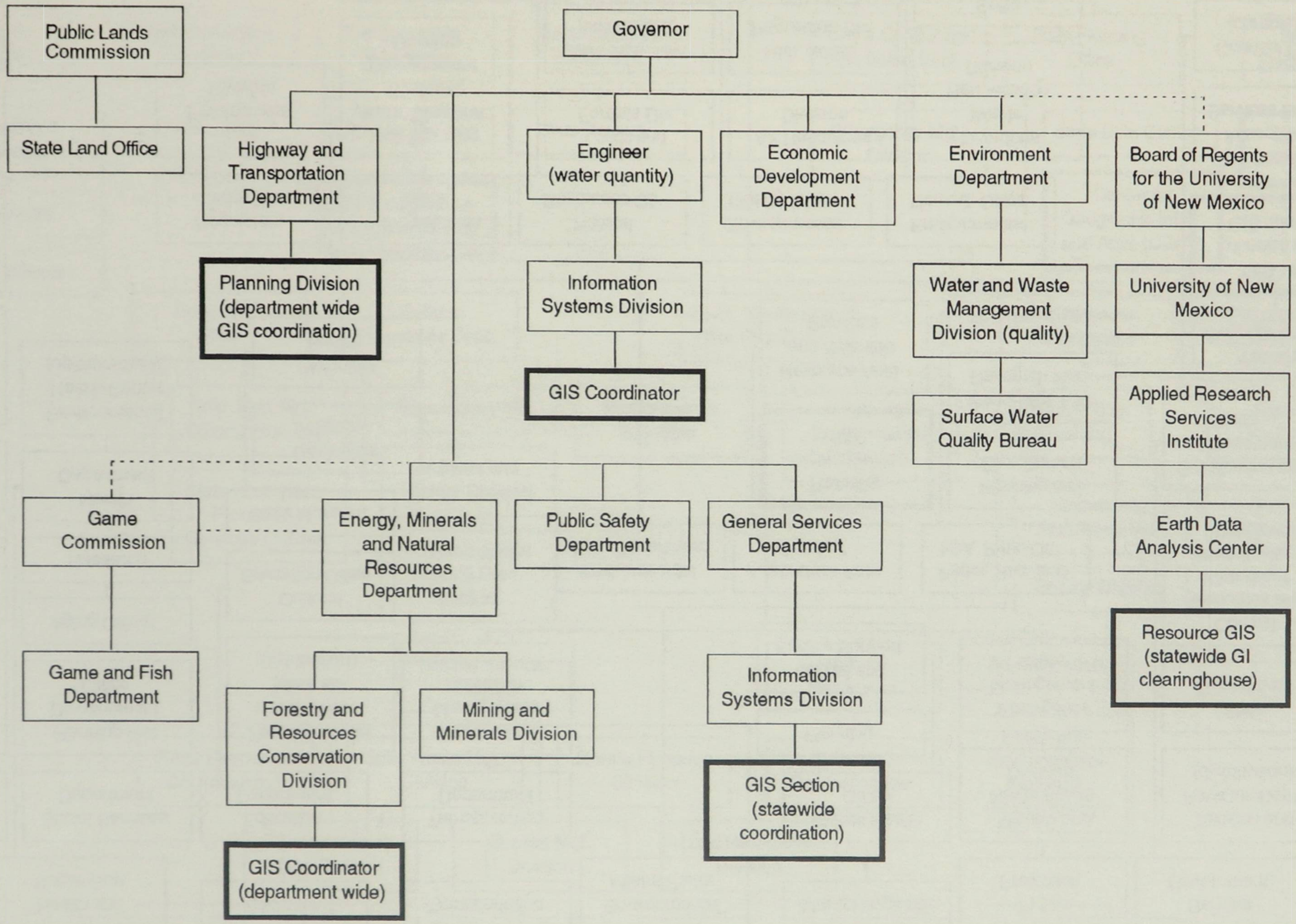

Governor
General Government
Transportation
Justice and Public Protection Administration
Executive Department
Education
Cultural Affairs Department
Administrative Services Department
Transportation Department
Public Utilities Commission
State Planning Office
Higher Education Systems
Historical Resources Division
Information Technology Management Office
Statewide GIS Coordination
University of New Hampshire
Archaeologist
Resource Protection and Development
Complex Systems Research Center
Resources and Economic Development Department
Fish and Game Department
Environmental Services Department
Geographically Referenced Analysis and Information Transfer (GRANIT) (statewide center)
Planning Unit
Forests and Lands Division
Natural Heritage Inventory
Waste Management Division
Water Resources Division
Water Supply and Pollution Control Division

New Hampshire - GI/GIS

New Jersey - GI/GIS


Governor
State Planning Office
Law and Public Safety Department
State Police
Emergency Mgt. Section
Community Affairs Department
Local Government Services Division
Health Department
Health Statistics Center (epidemiology)
Treasury Department
Telecommunications and Information Systems Office
Environmental Protection Department
Transportation Department
Deputy
Water Supply
Information Resource Mgt.
Geographic Info. and Analysis Bureau (dept. wide GIS)
Nat. and Historic Res. Assistant
Fish, Game and Wildlife Division
Green Acres (open space acquisition)
Parks and Forestry Div.
Park Service
Forestry Service
Historic Pres. Of.
Resource Dev.
Natural Lands Mgt. Office
Natural Heritage Prog.
Enforcement Assistant
Field Operations Enforcement Division
Enforcement Coordination
Coastal and Land Use Enforcement
Cooperative Coastal Monitoring and Operation Clean Shores
Local Environmental Management
Policy and Planning Assist.
Science and Research Division
Geological Surv.
Water Monitoring Mgt.
Air Quality Mgt. Office
Energy Office
Env. Safety, Health and Analytical Programs Div.
Env. Regulation Assistant
Air Quality Regulation
Hazardous Waste Regulation
Wastewater Facilities Regulation
Land and Water Planning (coastal)
Land Use Regulation (including coastal)
Site Remediation Assistant
Publicly Funded Site Remediation Division
Responsible Party Site Remediation Division
Environmental Claims

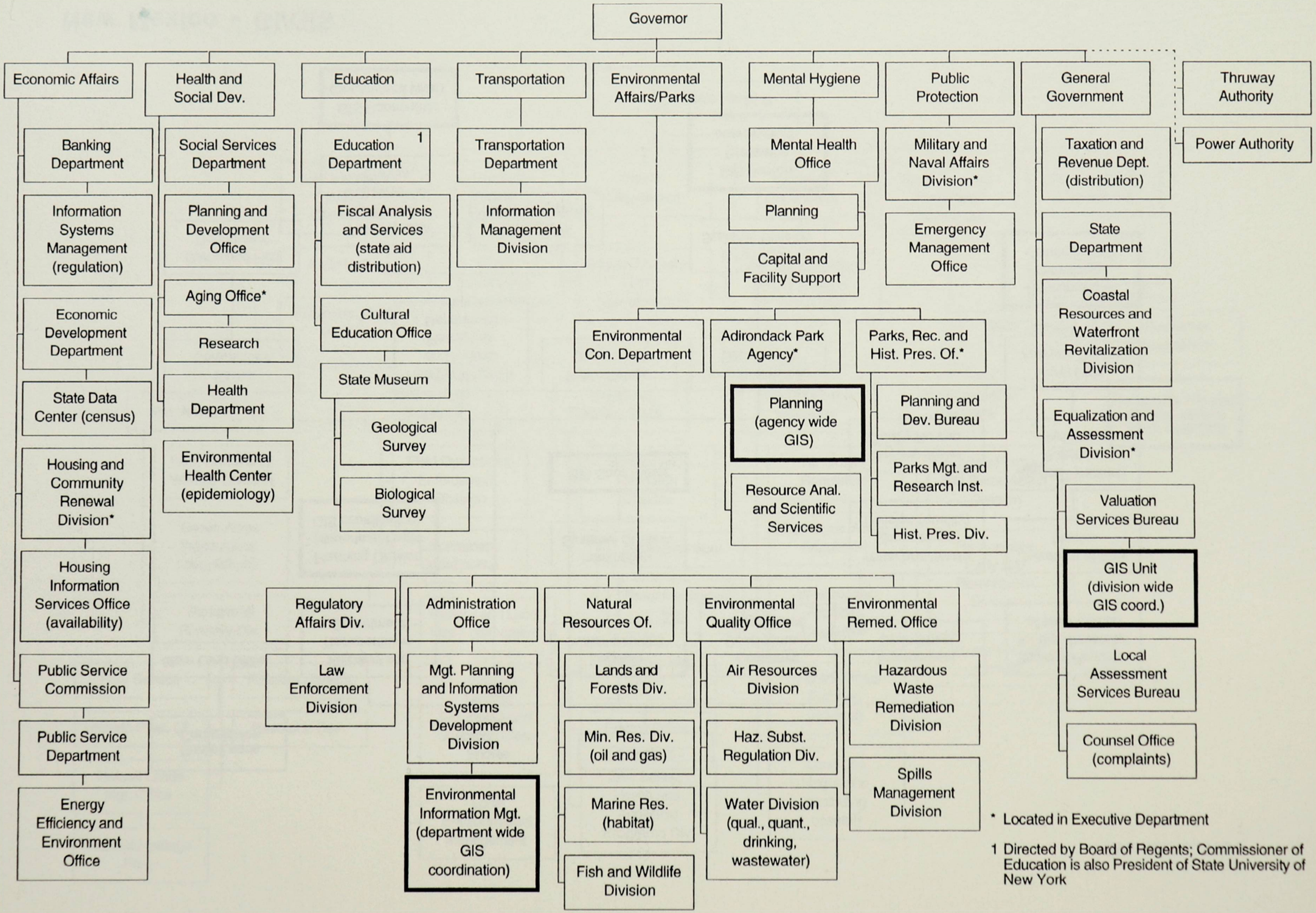
Warnecke, 1994



Public Lands Commission
State Land Office
Governor
Highway and Transportation Department
Planning Division (department wide GIS coordination)
Engineer (water quantity)
Information Systems Division
GIS Coordinator
Economic Development Department
Environment Department
Water and Waste Management Division (quality)
Surface Water Quality Bureau
Board of Regents for the University of New Mexico
University of New Mexico
Applied Research Services Institute
Earth Data Analysis Center
Resource GIS (statewide GI clearinghouse)
Game Commission
Game and Fish Department
Energy, Minerals and Natural Resources Department
Forestry and Resources Conservation Division
GIS Coordinator (department wide)
Mining and Minerals Division
Public Safety Department
General Services Department
Information Systems Division
GIS Section (statewide coordination)

New Mexico - GI/GIS

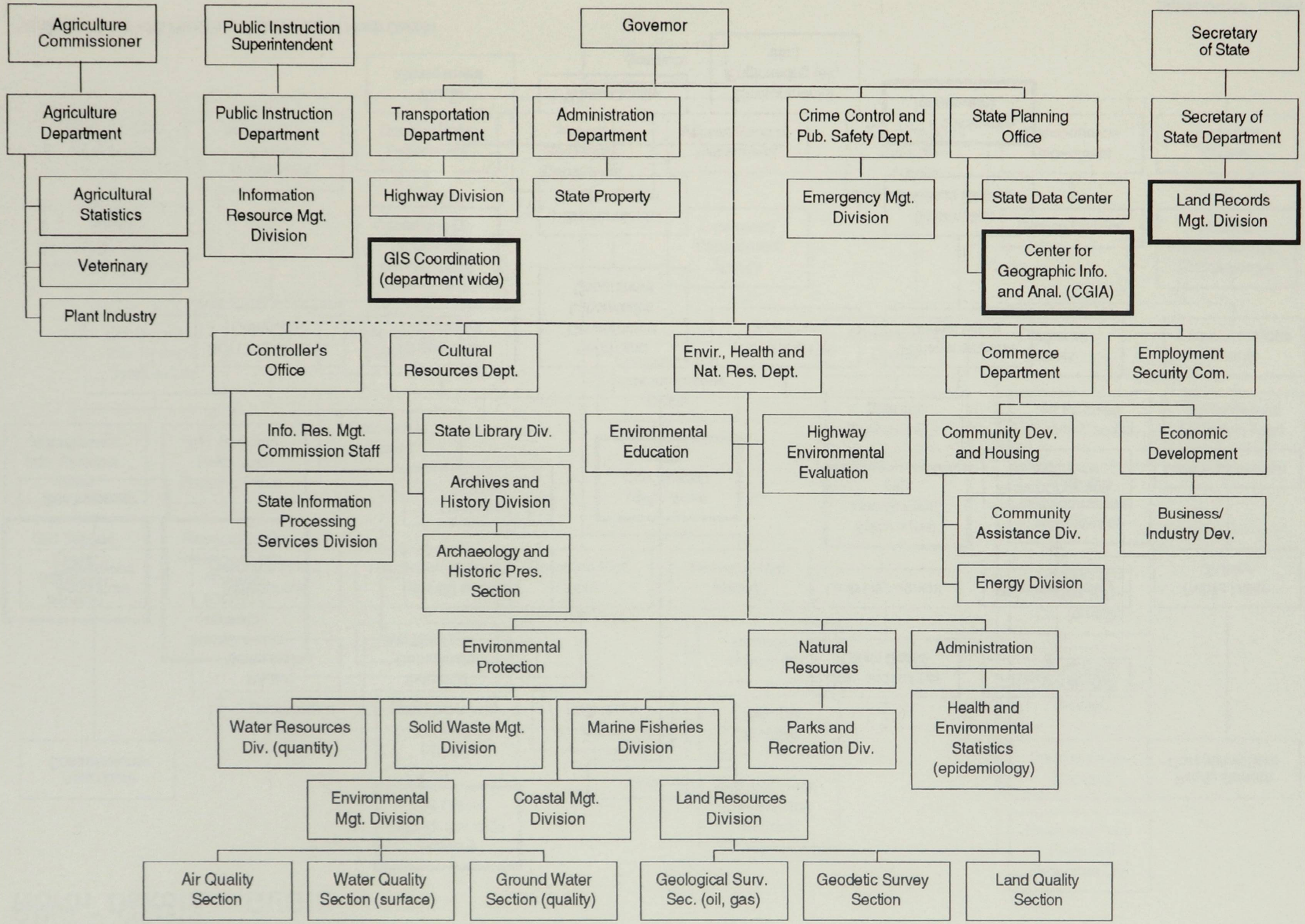
New York - GI/GIS


Governor
Economic Affairs
Banking Department
Information Systems Management (regulation)
Economic Development Department
State Data Center (census)
Housing and Community Renewal Division*
Housing Information Services Office (availability)
Public Service Commission
Public Service Department
Energy Efficiency and Environment Office
Health and Social Dev.
Social Services Department
Planning and Development Office
Aging Office*
Research
Health Department
Environmental Health Center (epidemiology)
Education
Education Department 1
Fiscal Analysis and Services (state aid distribution)
Cultural Education Office
State Museum
Geological Survey
Biological Survey
Transportation
Transportation Department
Information Management Division
Environmental Affairs/Parks
Environmental Con. Department
Adirondack Park Agency*
Planning (agency wide GIS)
Resource Anal. and Scientific Services
Parks, Rec. and Hist. Pres. Of.*
Planning and Dev. Bureau
Parks Mgt. and Research Inst.
Hist. Pres. Div.
Regulatory Affairs Div.
Law Enforcement Division
Administration Office
Mgt. Planning and Information Systems Development Division
Environmental Information Mgt. (department wide GIS coordination)
Natural Resources Of.
Lands and Forests Div.
Min. Res. Div. (oil and gas)
Marine Res. (habitat)
Fish and Wildlife Division
Environmental Quality Office
Air Resources Division
Haz. Subst. Regulation Div.
Water Division (qual., quant., drinking, wastewater)
Environmental Remed. Office
Hazardous Waste Remediation Division
Spills Management Division
Mental Hygiene
Mental Health Office
Planning
Capital and Facility Support
Public Protection
Military and Naval Affairs Division*
Emergency Management Office
General Government
Taxation and Revenue Dept. (distribution)
State Department
Coastal Resources and Waterfront Revitalization Division
Equalization and Assessment Division*
Valuation Services Bureau
GIS Unit (division wide GIS coord.)
Local Assessment Services Bureau
Counsel Office (complaints)
Thruway Authority
Power Authority

* Located in Executive Department

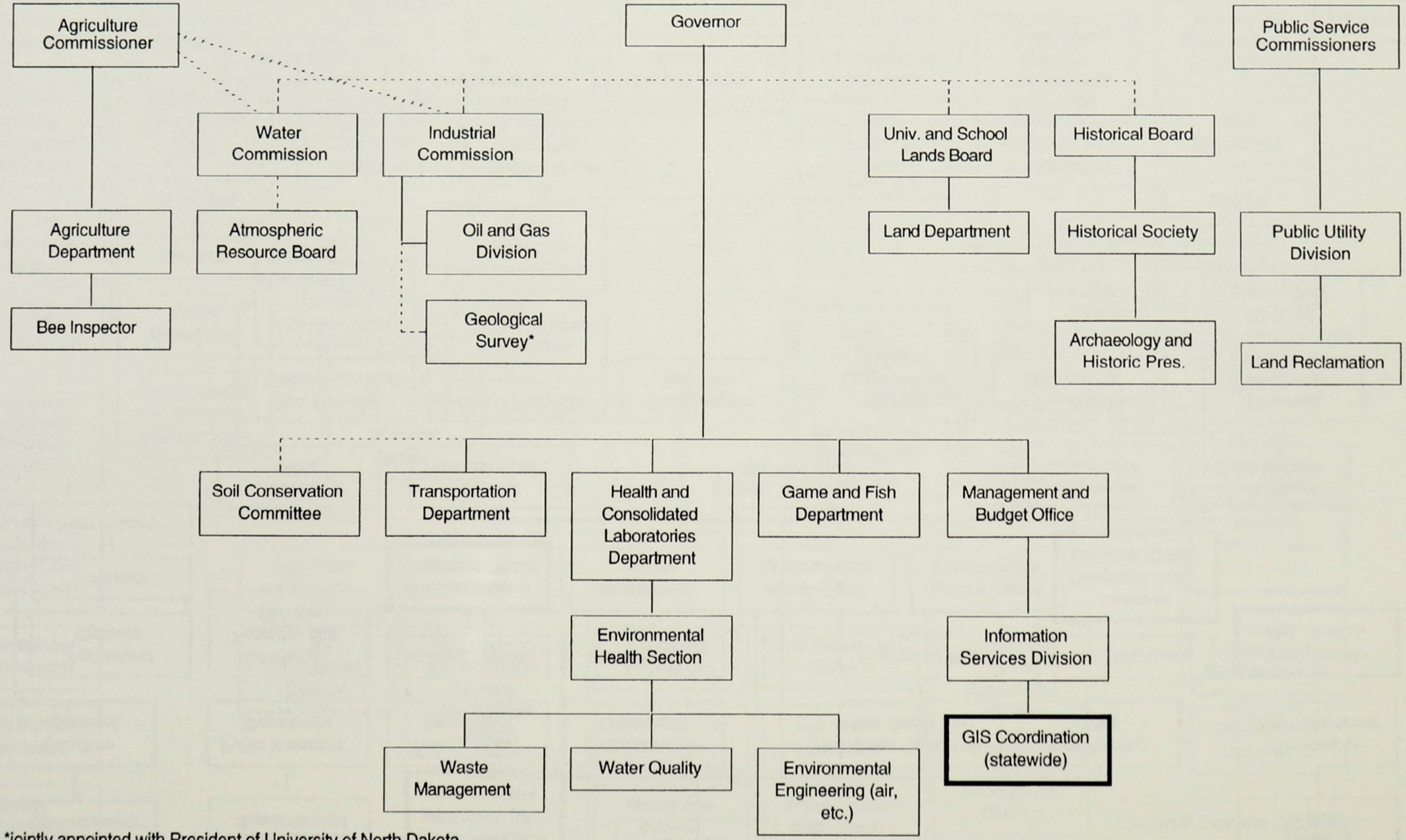
1 Directed by Board of Regents; Commissioner of Education is also President of State University of New York

Warnecke, 1994


Agriculture Commissioner
Agriculture Department
Agricultural Statistics
Veterinary
Plant Industry
Public Instruction Superintendent
Public Instruction Department
Information Resource Mgt. Division
Governor
Transportation Department
Highway Division
GIS Coordination (department wide)
Administration Department
State Property
Crime Control and Pub. Safety Dept.
Emergency Mgt. Division
State Planning Office
State Data Center
Center for Geographic Info. and Anal. (CGIA)
Secretary of State
Secretary of State Department
Land Records Mgt. Division
Controller's Office
Info. Res. Mgt. Commission Staff
State Information Processing Services Division
Cultural Resources Dept.
State Library Div.
Archives and History Division
Archaeology and Historic Pres. Section
Envir., Health and Nat. Res. Dept.
Environmental Education
Highway Environmental Evaluation
Commerce Department
Community Dev. and Housing
Community Assistance Div.
Energy Division
Economic Development
Business/ Industry Dev.
Employment Security Com.
Environmental Protection
Water Resources Div. (quantity)
Solid Waste Mgt. Division
Marine Fisheries Division
Environmental Mgt. Division
Coastal Mgt. Division
Land Resources Division
Air Quality Section
Water Quality Section (surface)
Ground Water Section (quality)
Geological Surv. Sec. (oil, gas)
Geodetic Survey Section
Land Quality Section
Natural Resources
Parks and Recreation Div.
Administration
Health and Environmental Statistics (epidemiology)

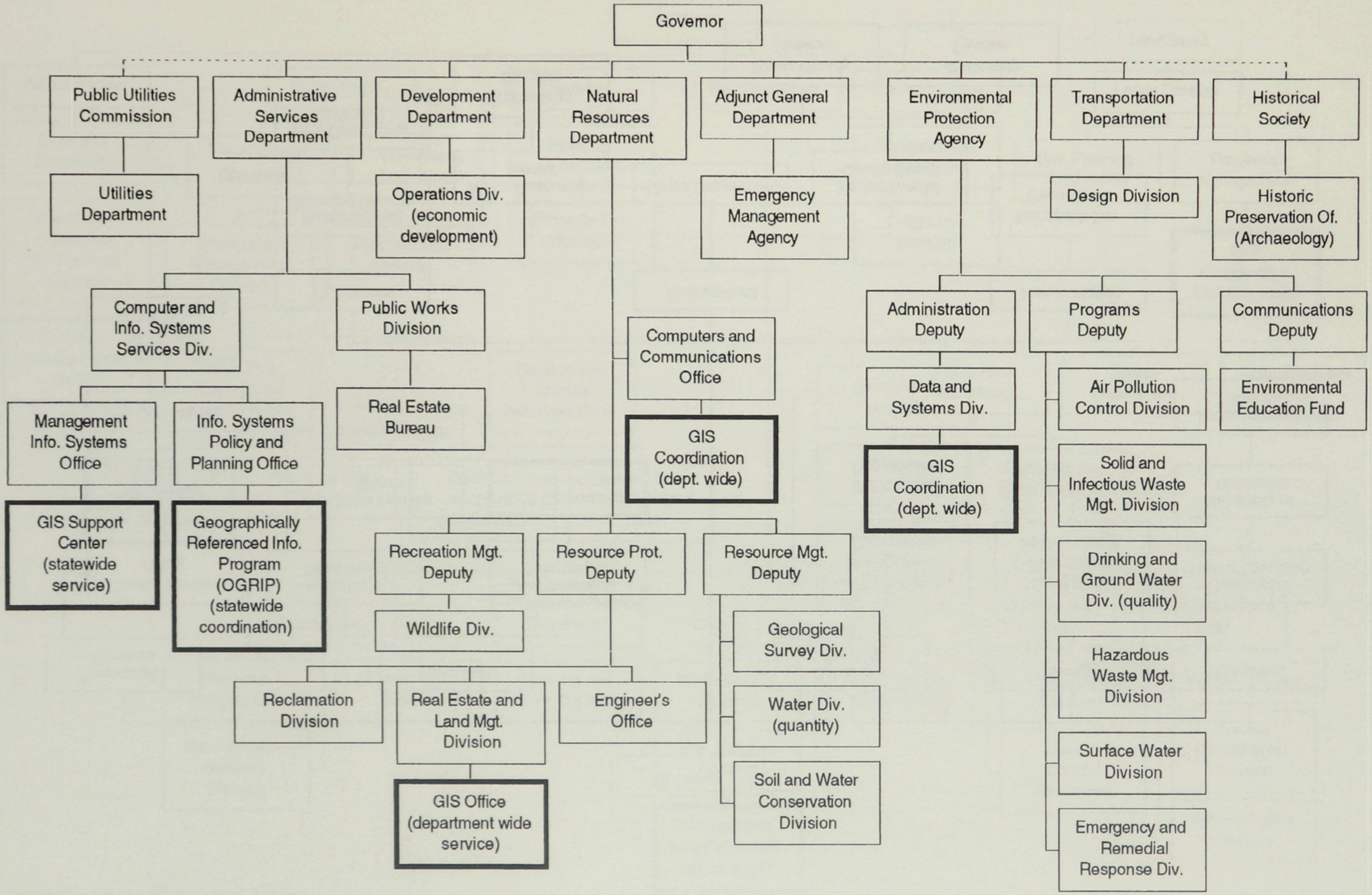
North Carolina - GI/GIS

North Dakota - GI/GIS


Agriculture Commissioner
Governor
Public Service Commissioners
Water Commission
Industrial Commission
Univ. and School Lands Board
Historical Board
Agriculture Department
Atmospheric Resource Board
Oil and Gas Division
Land Department
Historical Society
Public Utility Division
Bee Inspector
Geological Survey*
Archaeology and Historic Pres.
Land Reclamation
Soil Conservation Committee
Transportation Department
Health and Consolidated Laboratories Department
Game and Fish Department
Management and Budget Office
Environmental Health Section
Information Services Division
GIS Coordination (statewide)
Waste Management
Water Quality
Environmental Engineering (air, etc.)

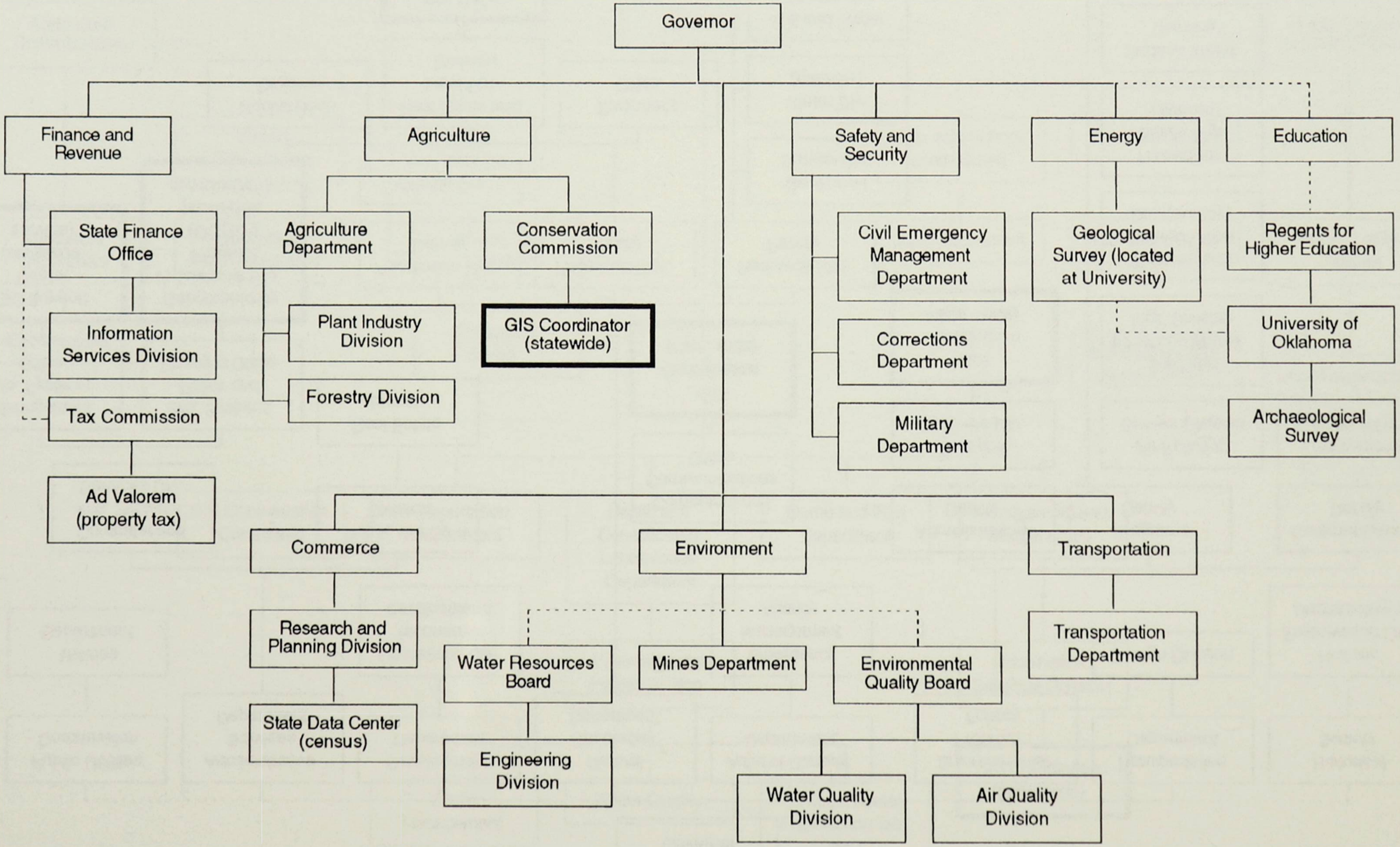
*jointly appointed with President of University of North Dakota

Warnecke, 1994


Governor
Public Utilities Commission
Administrative Services Department
Development Department
Natural Resources Department
Adjunct General Department
Environmental Protection Agency
Transportation Department
Historical Society
Utilities Department
Operations Div. (economic development)
Emergency Management Agency
Design Division
Historic Preservation Of. (Archaeology)
Computer and Info. Systems Services Div.
Public Works Division
Computers and Communications Office
Administration Deputy
Programs Deputy
Communications Deputy
Management Info. Systems Office
Info. Systems Policy and Planning Office
Real Estate Bureau
GIS Coordination (dept. wide)
Data and Systems Div.
Air Pollution Control Division
Environmental Education Fund
GIS Support Center (statewide service)
Geographically Referenced Info. Program (OGRIP) (statewide coordination)
GIS Coordination (dept. wide)
Solid and Infectious Waste Mgt. Division
Recreation Mgt. Deputy
Resource Prot. Deputy
Resource Mgt. Deputy
Drinking and Ground Water Div. (quality)
Wildlife Div.
Geological Survey Div.
Hazardous Waste Mgt. Division
Reclamation Division
Real Estate and Land Mgt. Division
Engineer's Office
Water Div. (quantity)
Surface Water Division
Soil and Water Conservation Division
GIS Office (department wide service)
Emergency and Remedial Response Div.

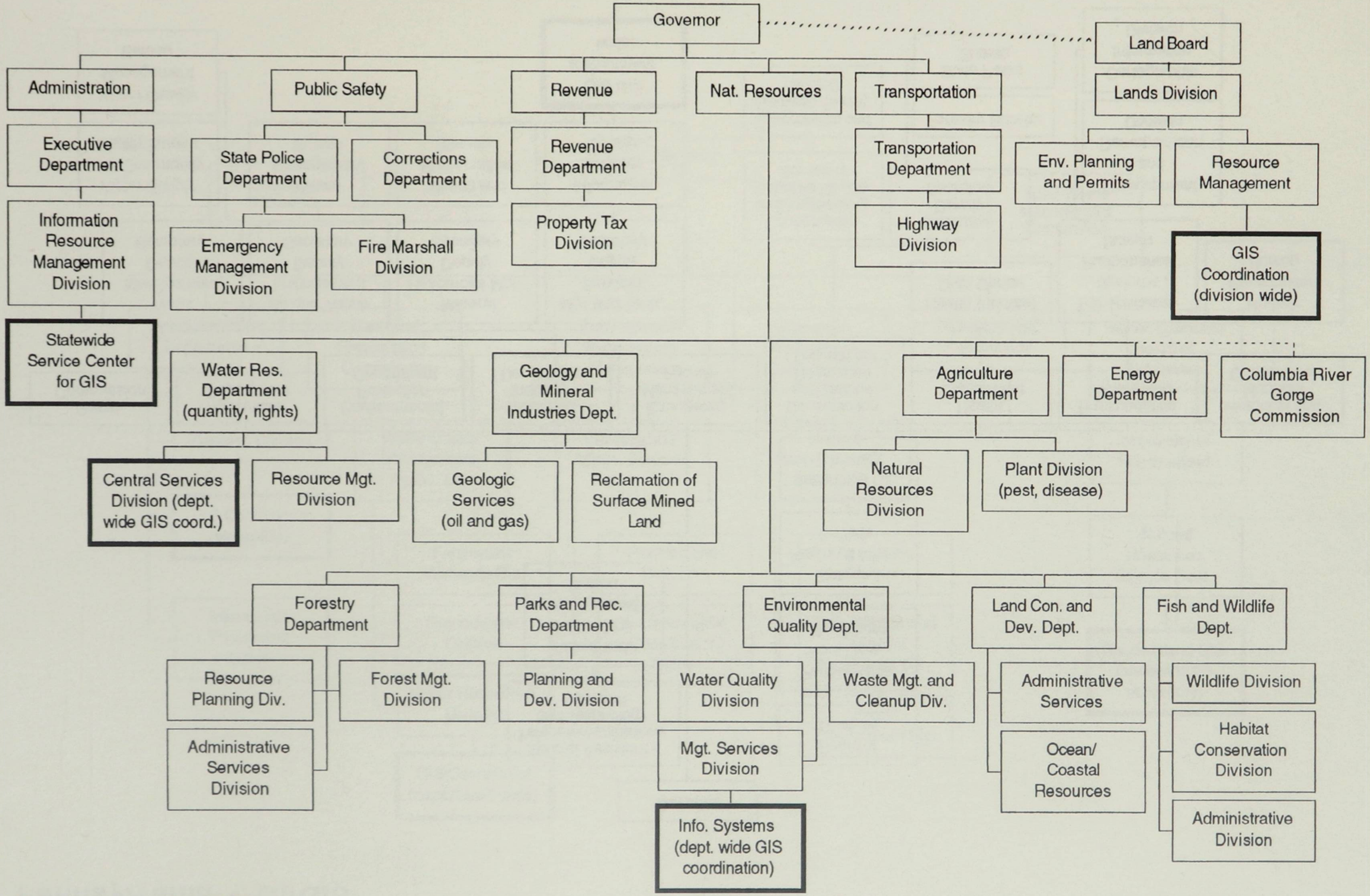
Ohio - GI/GIS

Oklahoma - GI/GIS



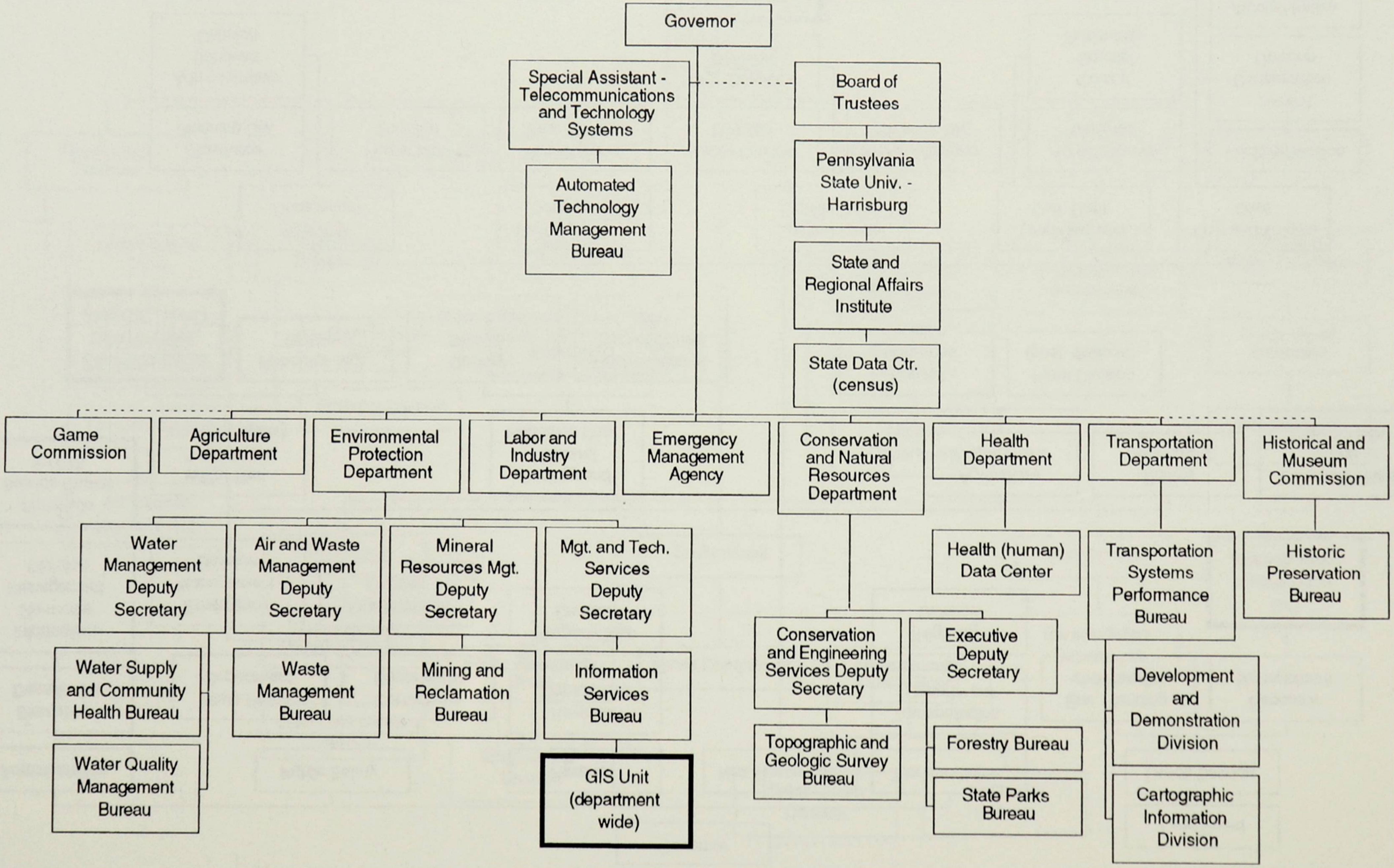
- Governor
  - Finance and Revenue
    - State Finance Office
      - Information Services Division
    - Tax Commission
      - Ad Valorem (property tax)
  - Agriculture
    - Agriculture Department
      - Plant Industry Division
      - Forestry Division
    - Conservation Commission
      - **GIS Coordinator (statewide)**
  - Safety and Security
    - Civil Emergency Management Department
    - Corrections Department
    - Military Department
  - Energy
    - Geological Survey (located at University)
  - Education
    - Regents for Higher Education
      - University of Oklahoma
        - Archaeological Survey
  - Commerce
    - Research and Planning Division
      - State Data Center (census)
  - Environment
    - Water Resources Board
      - Engineering Division
    - Mines Department
    - Environmental Quality Board
      - Water Quality Division
      - Air Quality Division
  - Transportation
    - Transportation Department

Warnecke, 1995


Governor
Land Board
Lands Division
Administration
Executive Department
Information Resource Management Division
Statewide Service Center for GIS
Public Safety
State Police Department
Corrections Department
Emergency Management Division
Fire Marshall Division
Revenue
Revenue Department
Property Tax Division
Nat. Resources
Transportation
Transportation Department
Highway Division
Env. Planning and Permits
Resource Management
GIS Coordination (division wide)
Water Res. Department (quantity, rights)
Central Services Division (dept. wide GIS coord.)
Resource Mgt. Division
Geology and Mineral Industries Dept.
Geologic Services (oil and gas)
Reclamation of Surface Mined Land
Agriculture Department
Natural Resources Division
Plant Division (pest, disease)
Energy Department
Columbia River Gorge Commission
Forestry Department
Resource Planning Div.
Administrative Services Division
Forest Mgt. Division
Parks and Rec. Department
Planning and Dev. Division
Environmental Quality Dept.
Water Quality Division
Mgt. Services Division
Info. Systems (dept. wide GIS coordination)
Waste Mgt. and Cleanup Div.
Land Con. and Dev. Dept.
Administrative Services
Ocean/ Coastal Resources
Fish and Wildlife Dept.
Wildlife Division
Habitat Conservation Division
Administrative Division

Oregon - GI/GIS

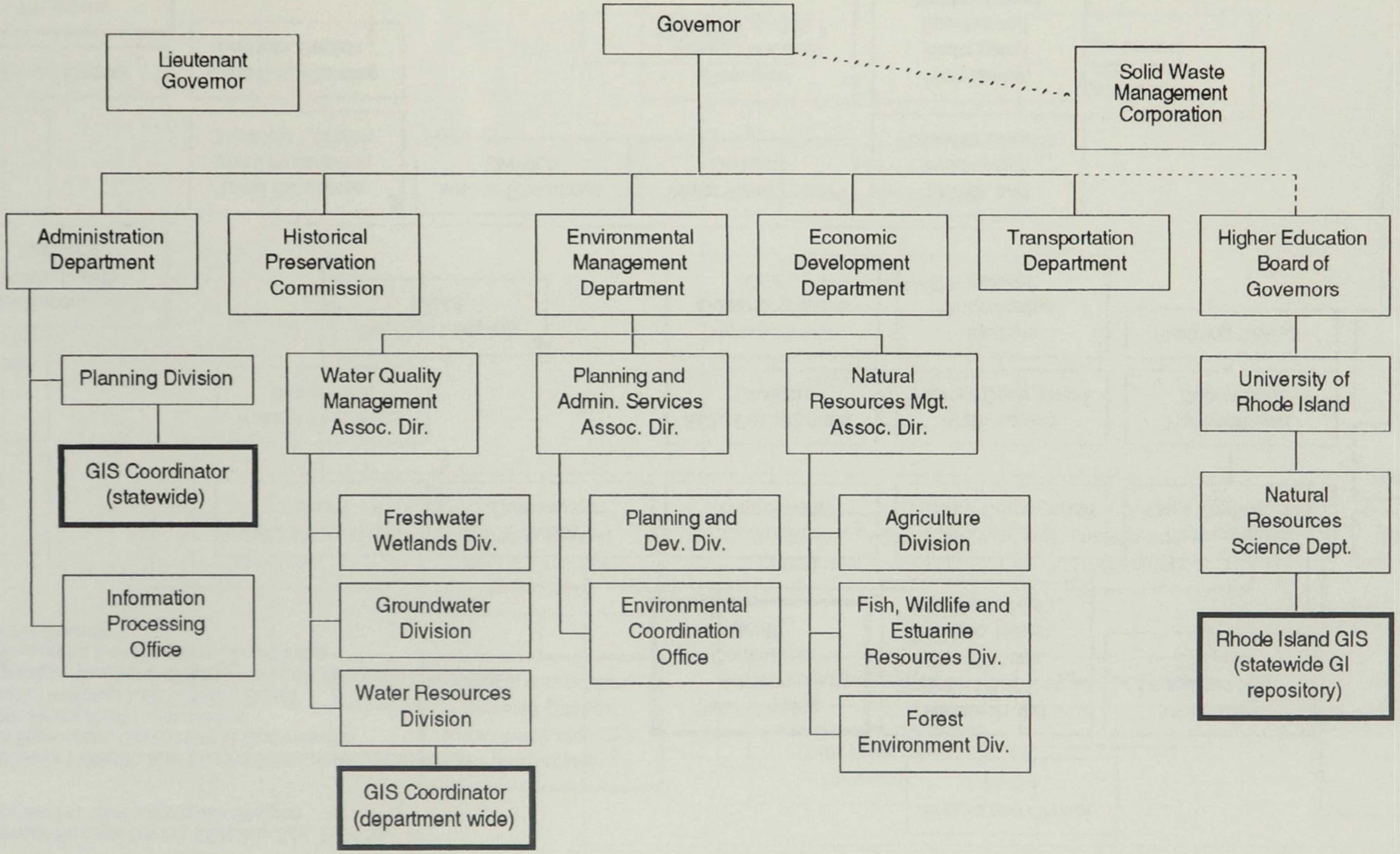
Pennsylvania - GI/GIS



- Governor
  - Special Assistant - Telecommunications and Technology Systems
    - Automated Technology Management Bureau
  - Board of Trustees
    - Pennsylvania State Univ. - Harrisburg
      - State and Regional Affairs Institute
        - State Data Ctr. (census)
  - Game Commission
  - Agriculture Department
  - Environmental Protection Department
    - Water Management Deputy Secretary
      - Water Supply and Community Health Bureau
      - Water Quality Management Bureau
    - Air and Waste Management Deputy Secretary
      - Waste Management Bureau
    - Mineral Resources Mgt. Deputy Secretary
      - Mining and Reclamation Bureau
    - Mgt. and Tech. Services Deputy Secretary
      - Information Services Bureau
        - **GIS Unit (department wide)**
  - Labor and Industry Department
  - Emergency Management Agency
  - Conservation and Natural Resources Department
    - Conservation and Engineering Services Deputy Secretary
      - Topographic and Geologic Survey Bureau
    - Executive Deputy Secretary
      - Forestry Bureau
      - State Parks Bureau
  - Health Department
    - Health (human) Data Center
  - Transportation Department
    - Transportation Systems Performance Bureau
      - Development and Demonstration Division
      - Cartographic Information Division
  - Historical and Museum Commission
    - Historic Preservation Bureau

Warnecke, 1995

Warnecke, 1994

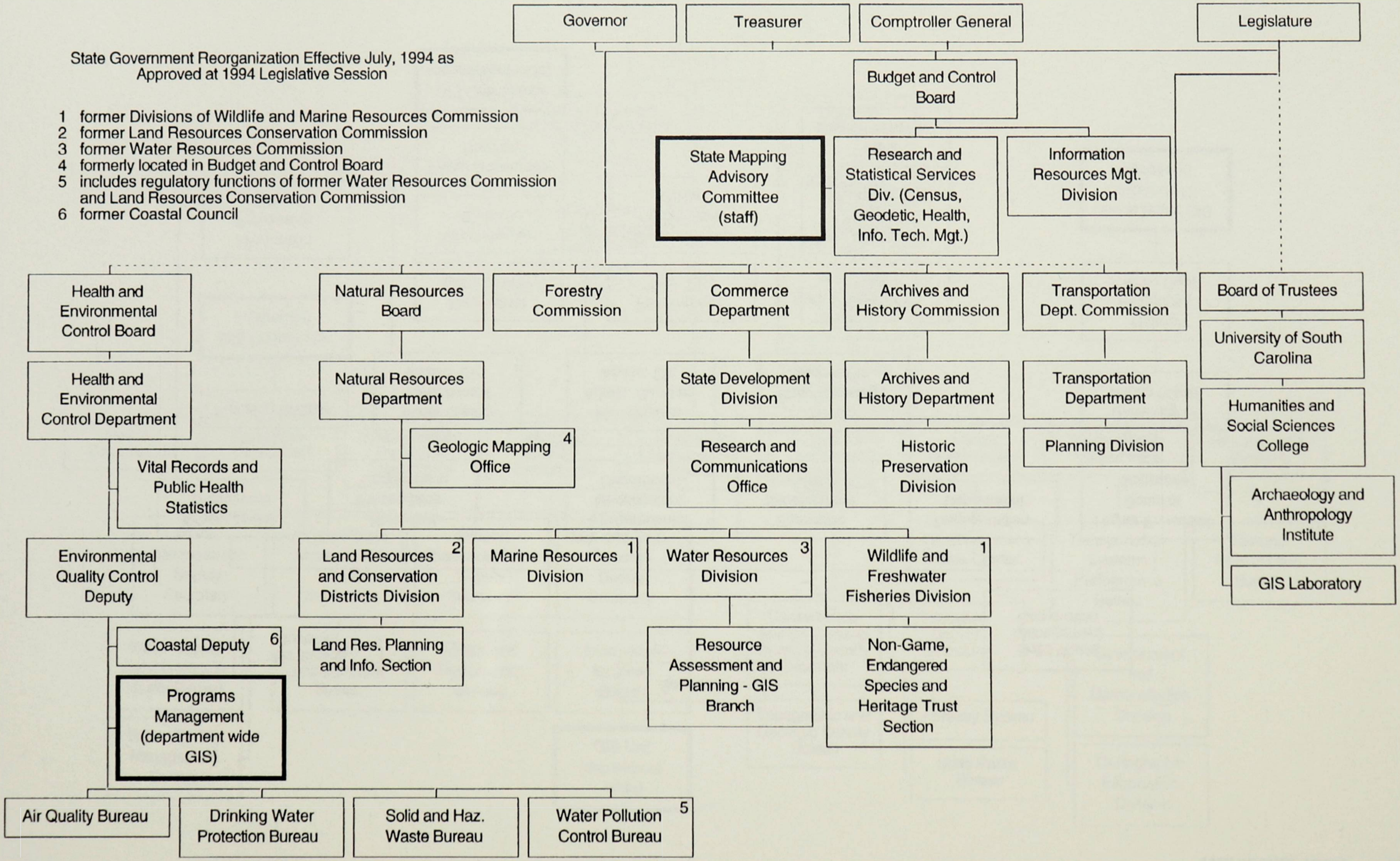

Governor
Lieutenant Governor
Solid Waste Management Corporation
Administration Department
Historical Preservation Commission
Environmental Management Department
Economic Development Department
Transportation Department
Higher Education Board of Governors
Planning Division
GIS Coordinator (statewide)
Information Processing Office
Water Quality Management Assoc. Dir.
Planning and Admin. Services Assoc. Dir.
Natural Resources Mgt. Assoc. Dir.
Freshwater Wetlands Div.
Groundwater Division
Water Resources Division
GIS Coordinator (department wide)
Planning and Dev. Div.
Environmental Coordination Office
Agriculture Division
Fish, Wildlife and Estuarine Resources Div.
Forest Environment Div.
University of Rhode Island
Natural Resources Science Dept.
Rhode Island GIS (statewide GI repository)

Rhode Island - GI/GIS

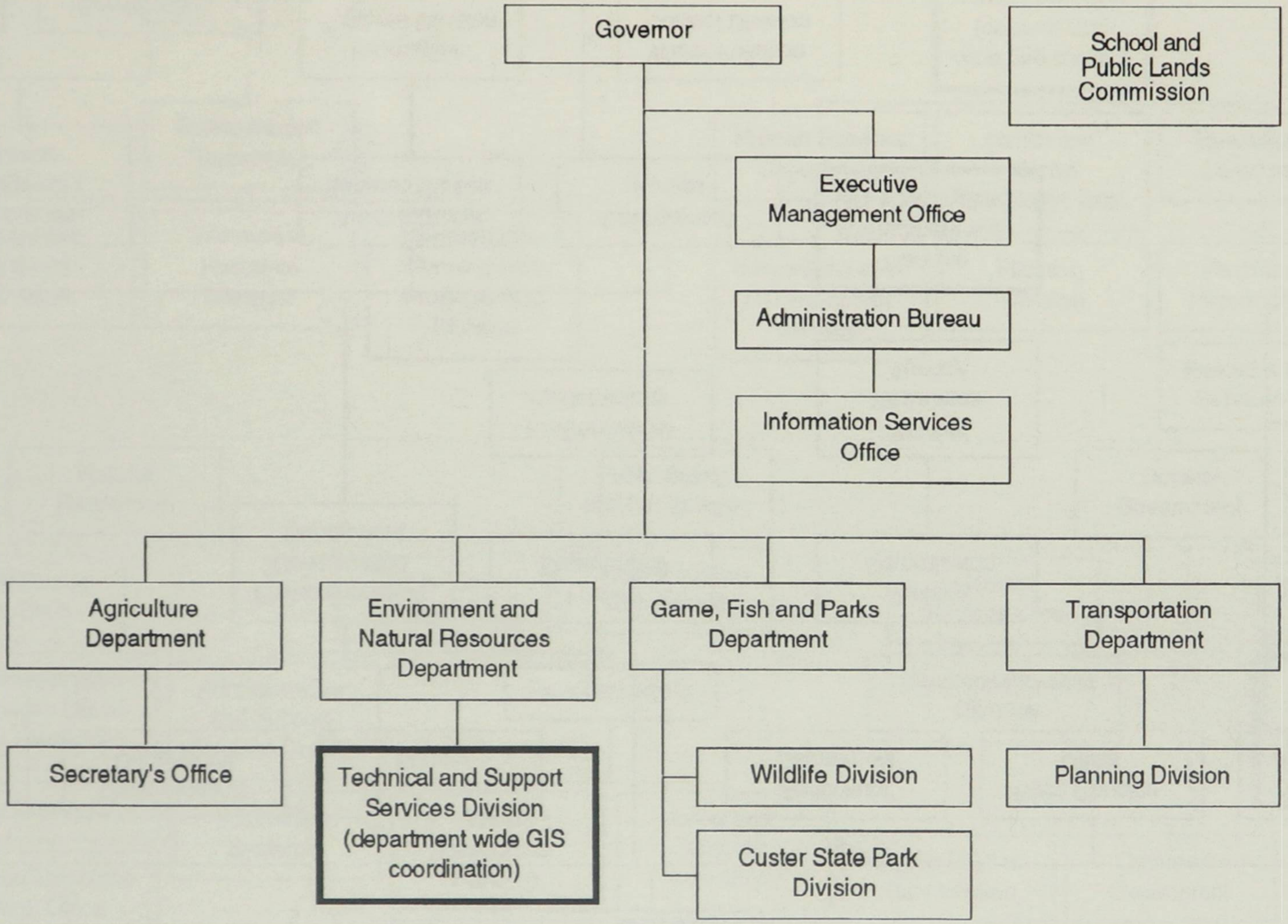
South Carolina - GI/GIS

State Government Reorganization Effective July, 1994 as
Approved at 1994 Legislative Session

1 former Divisions of Wildlife and Marine Resources Commission
2 former Land Resources Conservation Commission
3 former Water Resources Commission
4 formerly located in Budget and Control Board
5 includes regulatory functions of former Water Resources Commission and Land Resources Conservation Commission
6 former Coastal Council

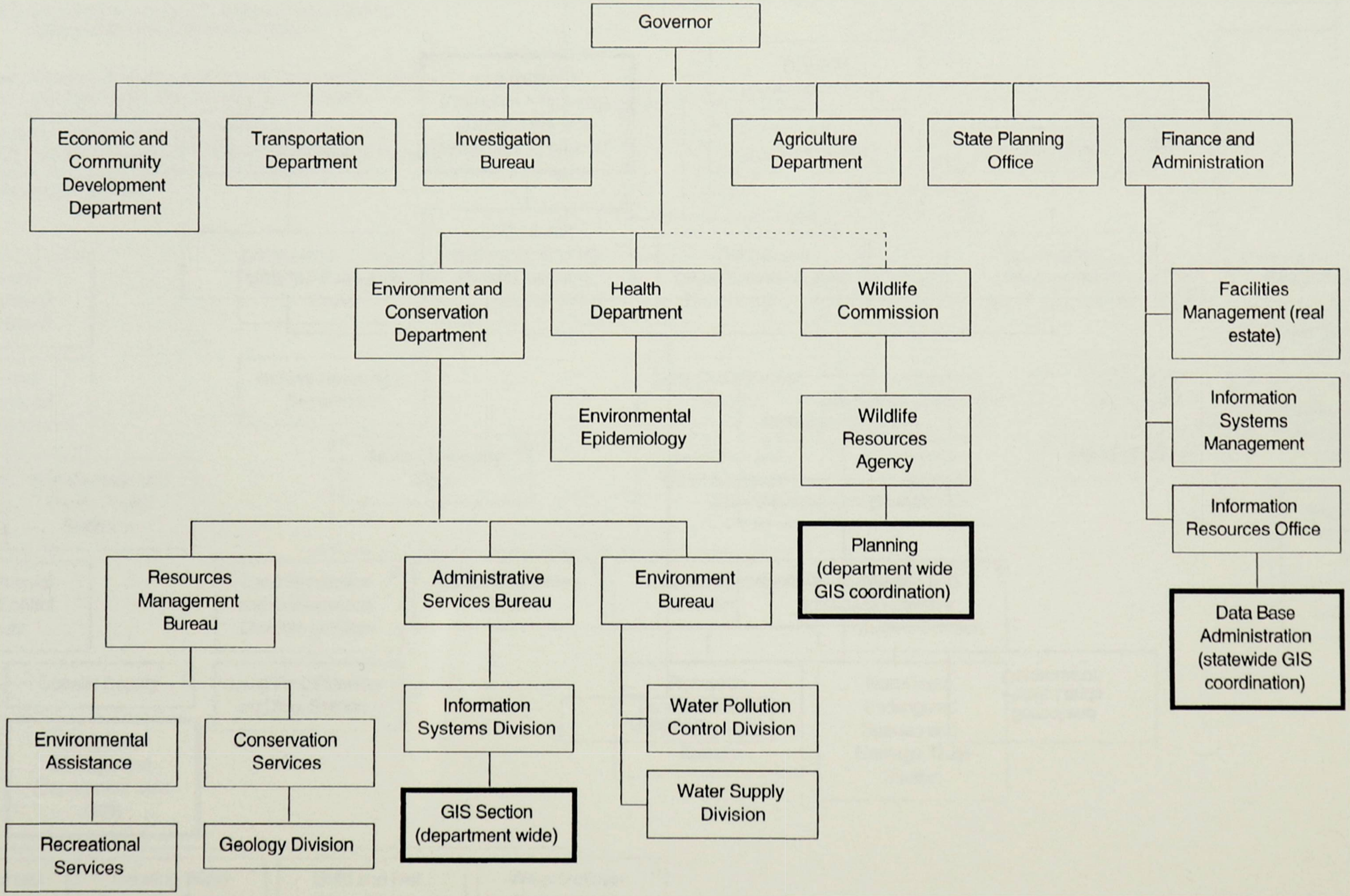

Governor
Treasurer
Comptroller General
Legislature
Budget and Control Board
State Mapping Advisory Committee (staff)
Research and Statistical Services Div. (Census, Geodetic, Health, Info. Tech. Mgt.)
Information Resources Mgt. Division
Health and Environmental Control Board
Natural Resources Board
Forestry Commission
Commerce Department
Archives and History Commission
Transportation Dept. Commission
Board of Trustees
Health and Environmental Control Department
Natural Resources Department
State Development Division
Archives and History Department
Transportation Department
University of South Carolina
Vital Records and Public Health Statistics
Geologic Mapping Office 4
Research and Communications Office
Historic Preservation Division
Planning Division
Humanities and Social Sciences College
Archaeology and Anthropology Institute
GIS Laboratory
Environmental Quality Control Deputy
Land Resources and Conservation Districts Division 2
Marine Resources Division 1
Water Resources Division 3
Wildlife and Freshwater Fisheries Division 1
Coastal Deputy 6
Land Res. Planning and Info. Section
Resource Assessment and Planning - GIS Branch
Non-Game, Endangered Species and Heritage Trust Section
Programs Management (department wide GIS)
Air Quality Bureau
Drinking Water Protection Bureau
Solid and Haz. Waste Bureau
Water Pollution Control Bureau 5

Warnecke, 1994


Governor
School and Public Lands Commission
Executive Management Office
Administration Bureau
Information Services Office
Agriculture Department
Environment and Natural Resources Department
Game, Fish and Parks Department
Transportation Department
Secretary's Office
Technical and Support Services Division (department wide GIS coordination)
Wildlife Division
Custer State Park Division
Planning Division

South Dakota - GI/GIS

Tennessee - GI/GIS



Governor

Economic and Community Development Department

Transportation Department

Investigation Bureau

Agriculture Department

State Planning Office

Finance and Administration

Environment and Conservation Department

Health Department

Wildlife Commission

Environmental Epidemiology

Wildlife Resources Agency

Planning (department wide GIS coordination)

Facilities Management (real estate)

Information Systems Management

Information Resources Office

Data Base Administration (statewide GIS coordination)

Resources Management Bureau

Administrative Services Bureau

Environment Bureau

Environmental Assistance

Conservation Services

Recreational Services

Geology Division

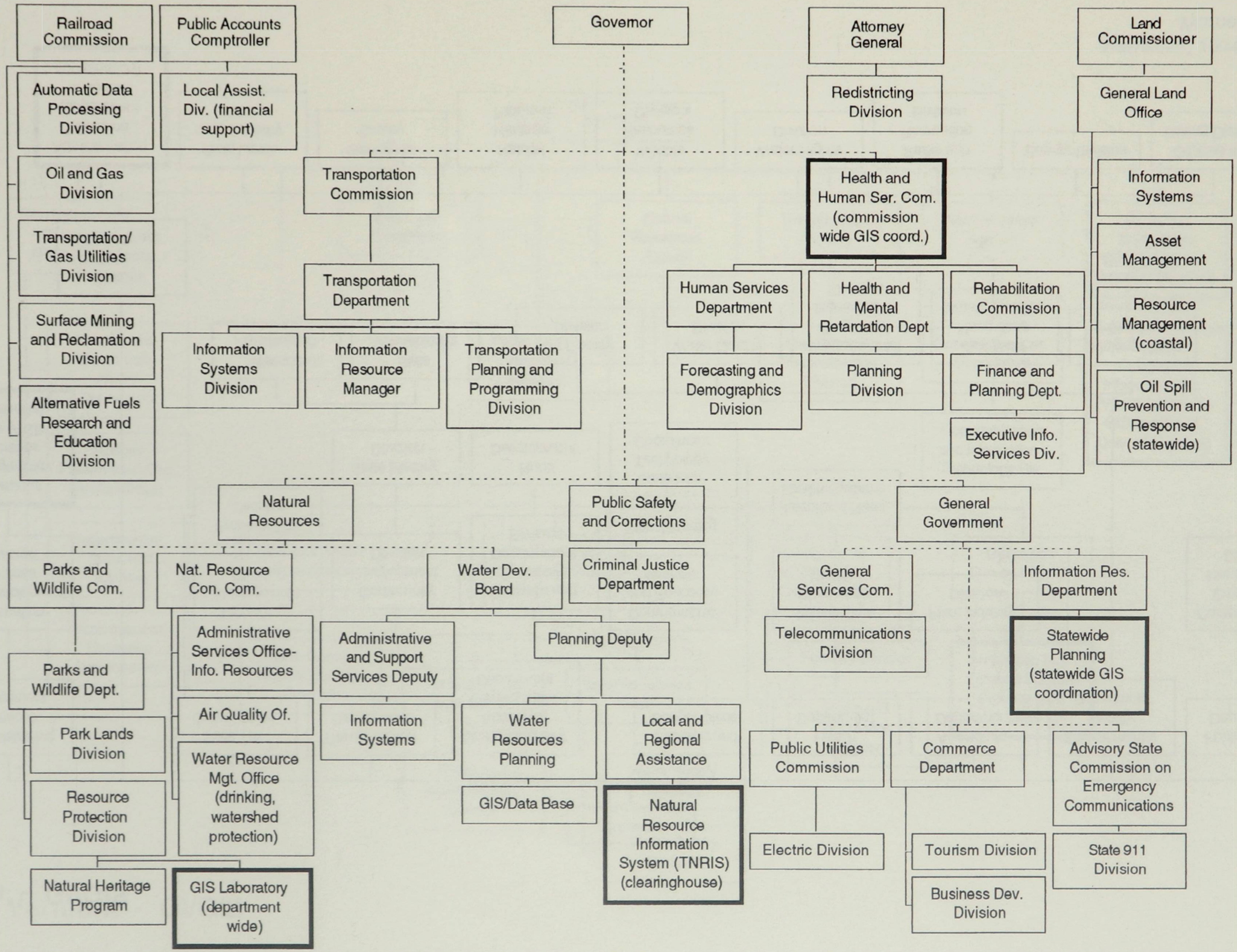
Information Systems Division

GIS Section (department wide)

Water Pollution Control Division

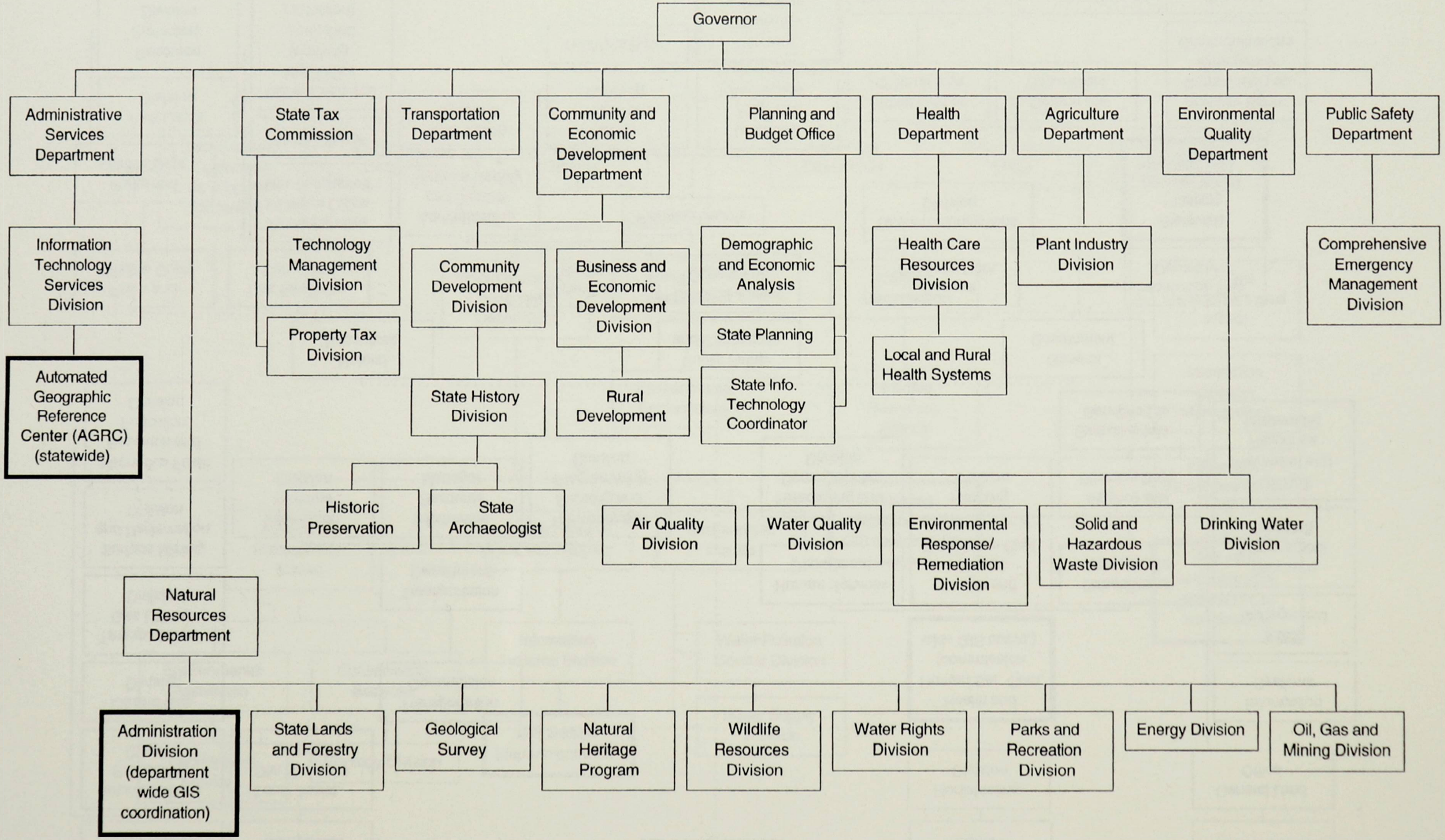
Water Supply Division

Warnecke, 1994

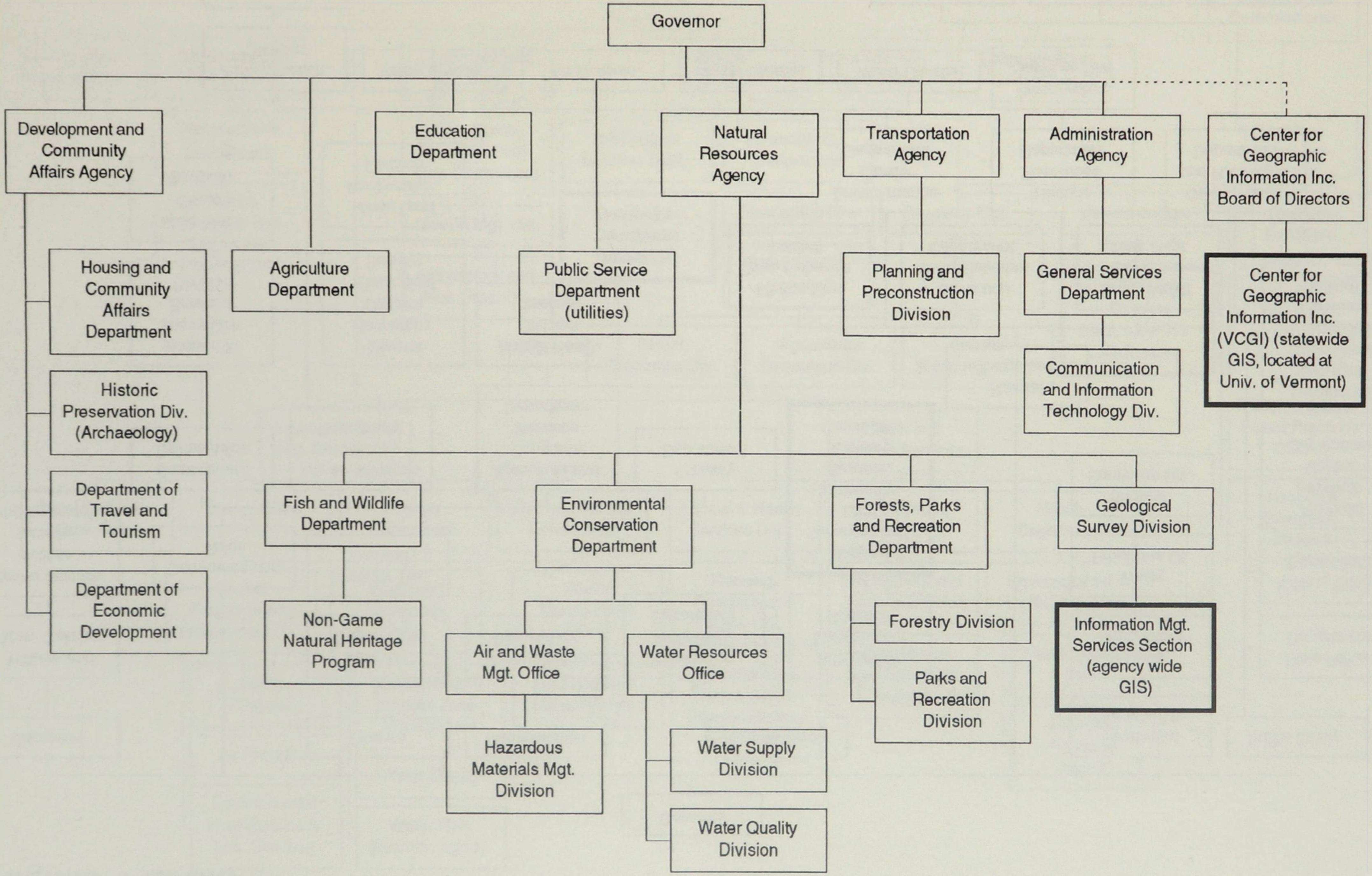

Railroad Commission
Public Accounts Comptroller
Governor
Attorney General
Land Commissioner
Automatic Data Processing Division
Local Assist. Div. (financial support)
Redistricting Division
General Land Office
Oil and Gas Division
Transportation Commission
Health and Human Ser. Com. (commission wide GIS coord.)
Information Systems
Transportation/ Gas Utilities Division
Asset Management
Transportation Department
Human Services Department
Health and Mental Retardation Dept
Rehabilitation Commission
Resource Management (coastal)
Surface Mining and Reclamation Division
Information Systems Division
Information Resource Manager
Transportation Planning and Programming Division
Forecasting and Demographics Division
Planning Division
Finance and Planning Dept.
Oil Spill Prevention and Response (statewide)
Alternative Fuels Research and Education Division
Executive Info. Services Div.
Natural Resources
Public Safety and Corrections
General Government
Parks and Wildlife Com.
Nat. Resource Con. Com.
Water Dev. Board
Criminal Justice Department
General Services Com.
Information Res. Department
Administrative Services Office-Info. Resources
Administrative and Support Services Deputy
Planning Deputy
Telecommunications Division
Statewide Planning (statewide GIS coordination)
Parks and Wildlife Dept.
Air Quality Of.
Information Systems
Water Resources Planning
Local and Regional Assistance
Park Lands Division
Water Resource Mgt. Office (drinking, watershed protection)
Public Utilities Commission
Commerce Department
Advisory State Commission on Emergency Communications
Resource Protection Division
GIS/Data Base
Natural Resource Information System (TNRIS) (clearinghouse)
Electric Division
Tourism Division
State 911 Division
Natural Heritage Program
GIS Laboratory (department wide)
Business Dev. Division

Texas - GI/GIS

Utah - GI/GIS

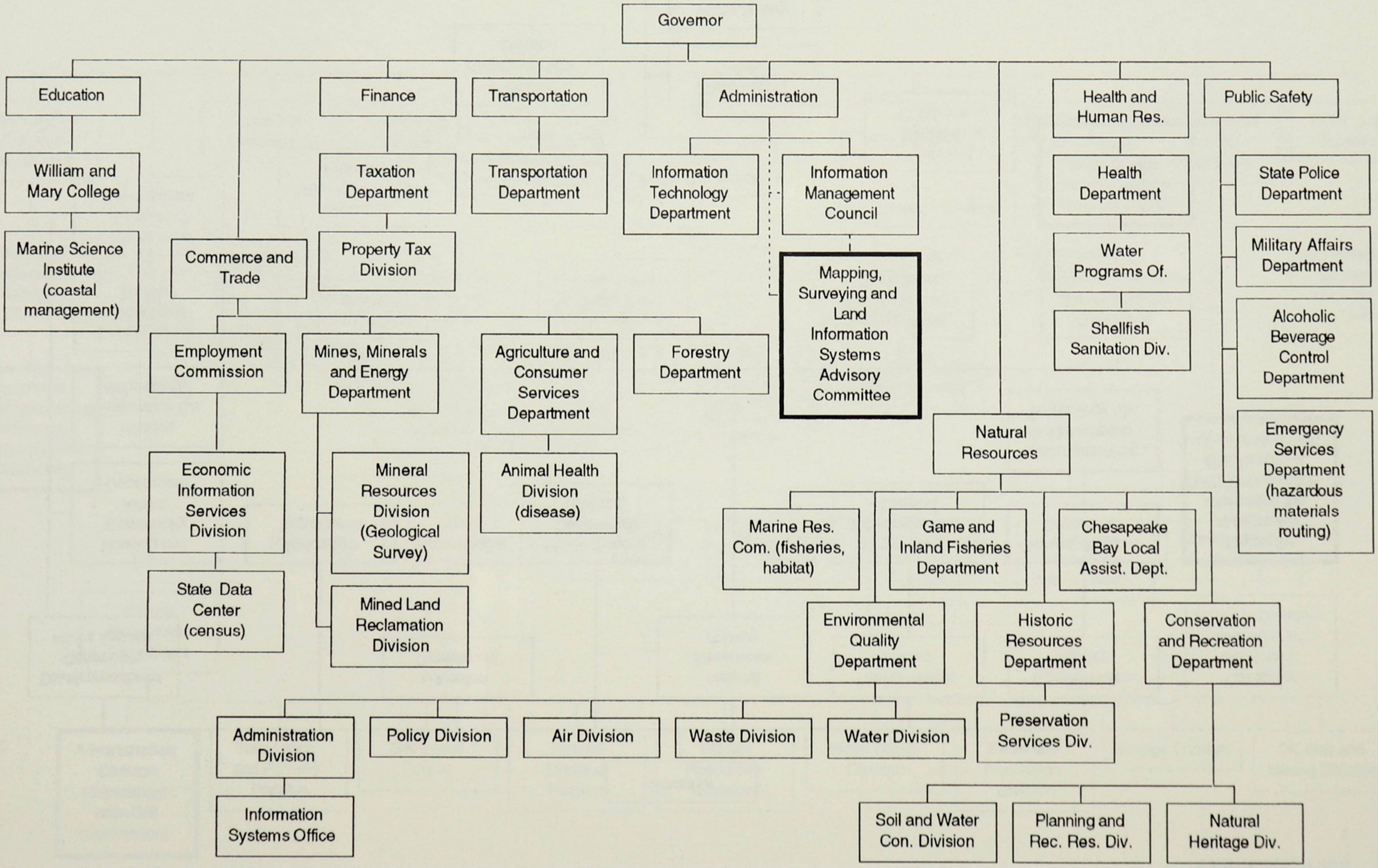

Governor
Administrative Services Department
State Tax Commission
Transportation Department
Community and Economic Development Department
Planning and Budget Office
Health Department
Agriculture Department
Environmental Quality Department
Public Safety Department
Information Technology Services Division
Technology Management Division
Property Tax Division
Community Development Division
Business and Economic Development Division
Demographic and Economic Analysis
State Planning
State Info. Technology Coordinator
Health Care Resources Division
Local and Rural Health Systems
Plant Industry Division
Comprehensive Emergency Management Division
Automated Geographic Reference Center (AGRC) (statewide)
State History Division
Rural Development
Historic Preservation
State Archaeologist
Air Quality Division
Water Quality Division
Environmental Response/ Remediation Division
Solid and Hazardous Waste Division
Drinking Water Division
Natural Resources Department
Administration Division (department wide GIS coordination)
State Lands and Forestry Division
Geological Survey
Natural Heritage Program
Wildlife Resources Division
Water Rights Division
Parks and Recreation Division
Energy Division
Oil, Gas and Mining Division

Warnecke, 1994


Governor
Development and Community Affairs Agency
Education Department
Natural Resources Agency
Transportation Agency
Administration Agency
Center for Geographic Information Inc. Board of Directors
Housing and Community Affairs Department
Agriculture Department
Public Service Department (utilities)
Planning and Preconstruction Division
General Services Department
Center for Geographic Information Inc. (VCGI) (statewide GIS, located at Univ. of Vermont)
Historic Preservation Div. (Archaeology)
Communication and Information Technology Div.
Department of Travel and Tourism
Department of Economic Development
Fish and Wildlife Department
Non-Game Natural Heritage Program
Environmental Conservation Department
Air and Waste Mgt. Office
Water Resources Office
Hazardous Materials Mgt. Division
Water Supply Division
Water Quality Division
Forests, Parks and Recreation Department
Forestry Division
Parks and Recreation Division
Geological Survey Division
Information Mgt. Services Section (agency wide GIS)

Vermont - GI/GIS

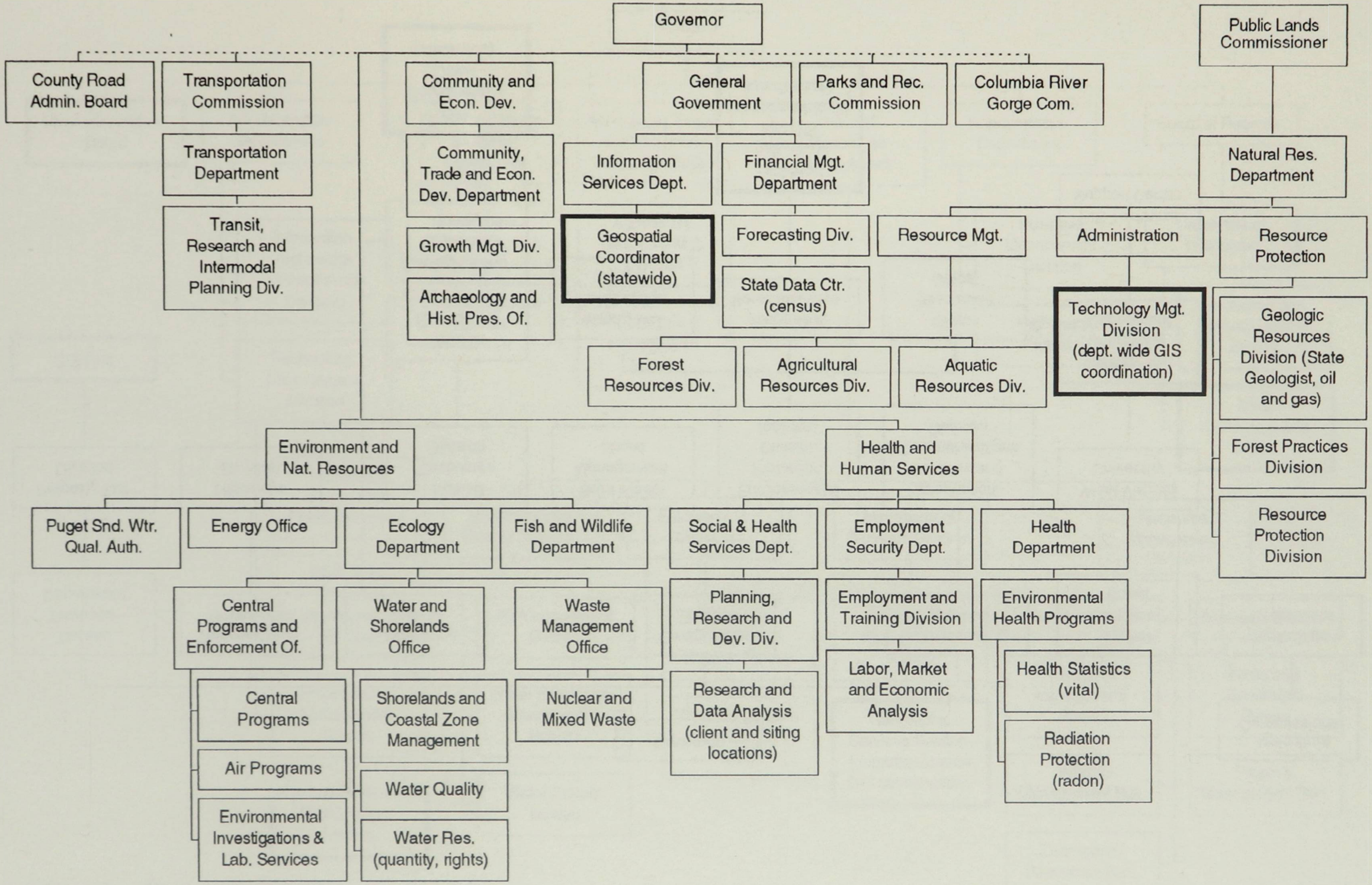
Virginia - GI/GIS



- Governor
  - Education
    - William and Mary College
      - Marine Science Institute (coastal management)
  - Commerce and Trade
    - Employment Commission
      - Economic Information Services Division
        - State Data Center (census)
    - Mines, Minerals and Energy Department
      - Mineral Resources Division (Geological Survey)
      - Mined Land Reclamation Division
    - Agriculture and Consumer Services Department
      - Animal Health Division (disease)
    - Forestry Department
  - Finance
    - Taxation Department
      - Property Tax Division
  - Transportation
    - Transportation Department
  - Administration
    - Information Technology Department
    - Information Management Council
      - **Mapping, Surveying and Land Information Systems Advisory Committee**
  - Natural Resources
    - Marine Res. Com. (fisheries, habitat)
    - Game and Inland Fisheries Department
    - Chesapeake Bay Local Assist. Dept.
    - Environmental Quality Department
      - Administration Division
        - Information Systems Office
      - Policy Division
      - Air Division
      - Waste Division
      - Water Division
    - Historic Resources Department
      - Preservation Services Div.
    - Conservation and Recreation Department
      - Soil and Water Con. Division
      - Planning and Rec. Res. Div.
      - Natural Heritage Div.
  - Health and Human Res.
    - Health Department
      - Water Programs Of.
        - Shellfish Sanitation Div.
  - Public Safety
    - State Police Department
    - Military Affairs Department
    - Alcoholic Beverage Control Department
    - Emergency Services Department (hazardous materials routing)

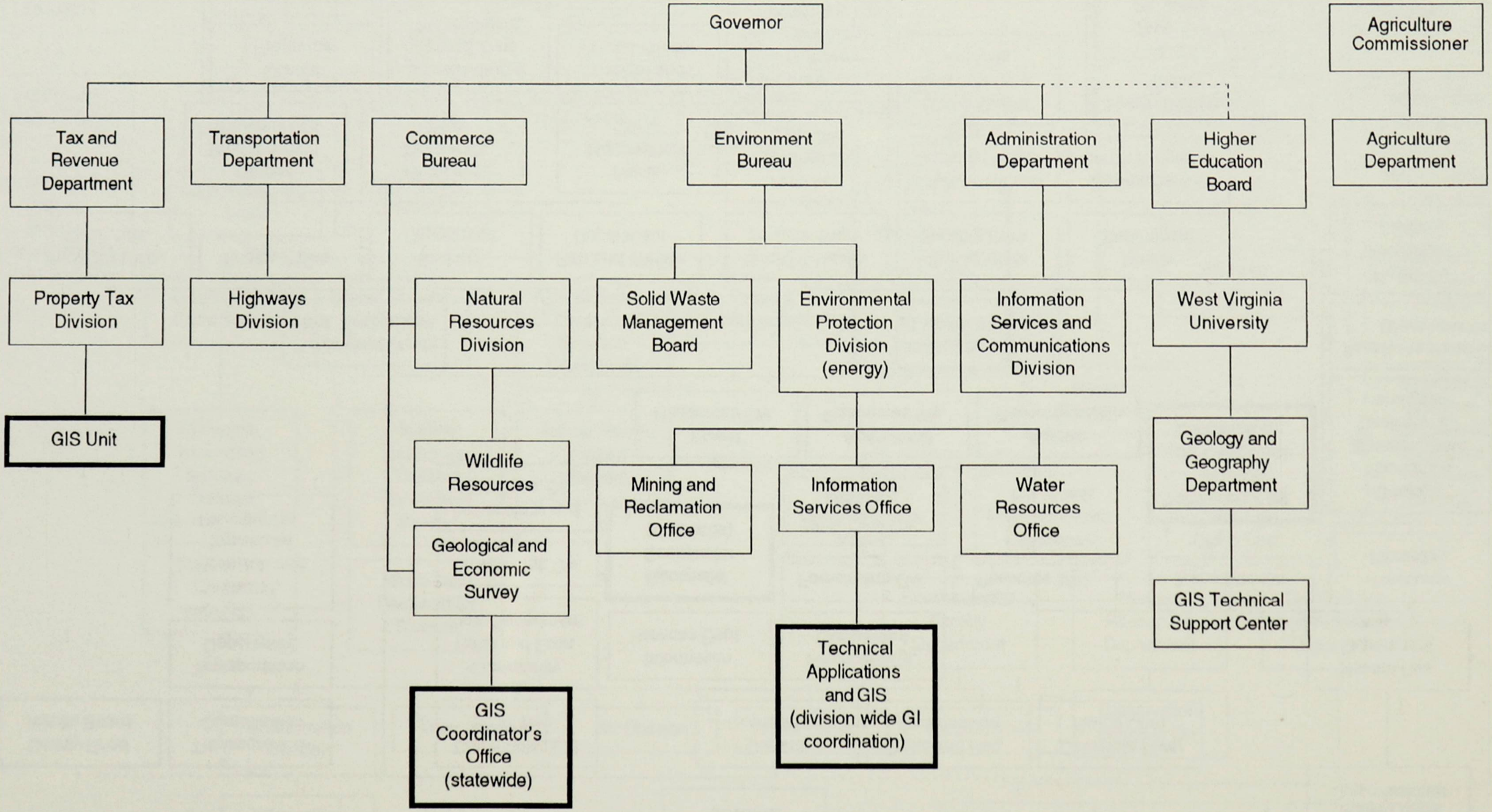
Warnecke, 1995

Warnecke, 1994

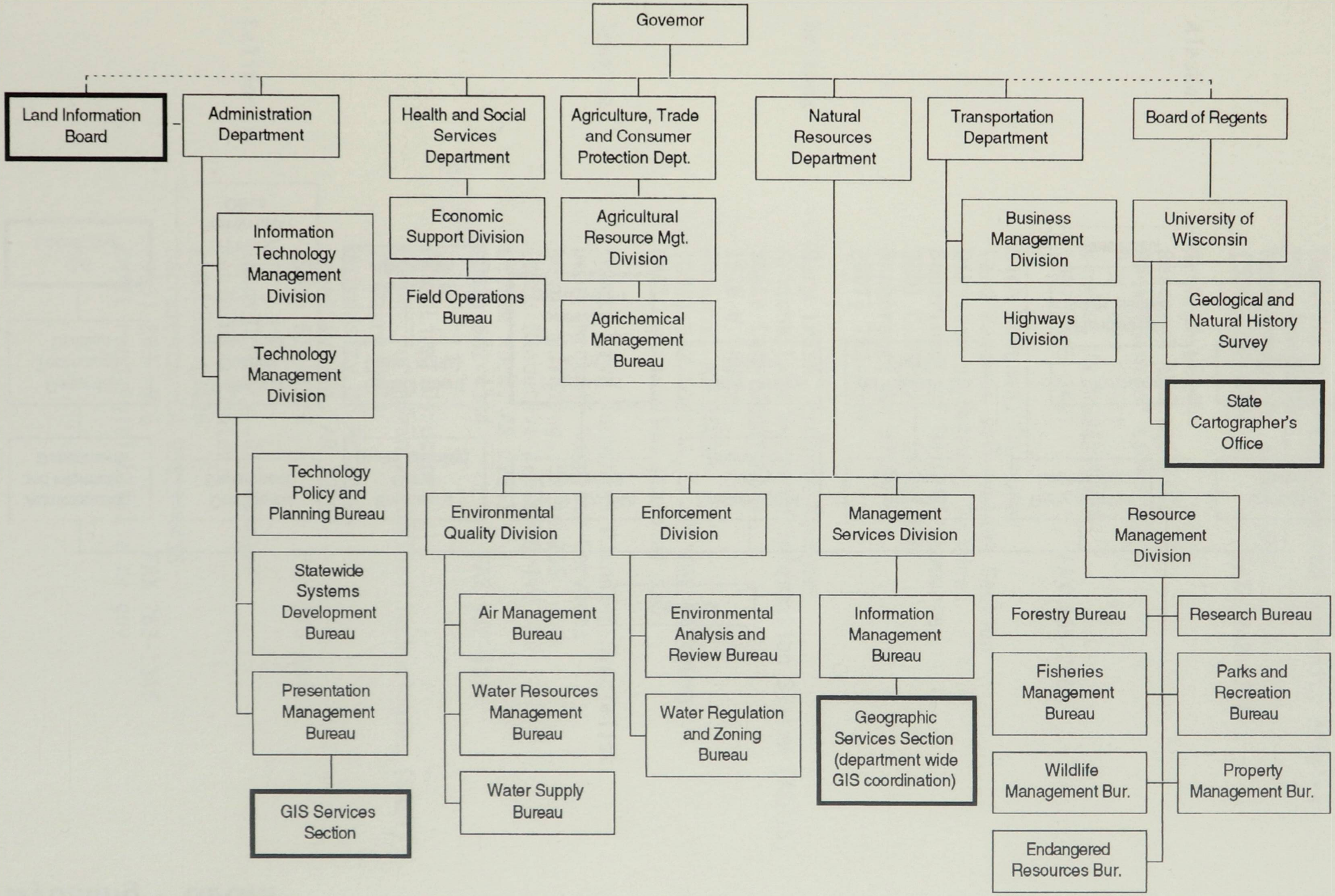

Governor
Public Lands Commissioner
County Road Admin. Board
Transportation Commission
Transportation Department
Transit, Research and Intermodal Planning Div.
Community and Econ. Dev.
Community, Trade and Econ. Dev. Department
Growth Mgt. Div.
Archaeology and Hist. Pres. Of.
General Government
Information Services Dept.
Geospatial Coordinator (statewide)
Financial Mgt. Department
Forecasting Div.
State Data Ctr. (census)
Parks and Rec. Commission
Columbia River Gorge Com.
Natural Res. Department
Resource Mgt.
Administration
Resource Protection
Technology Mgt. Division (dept. wide GIS coordination)
Forest Resources Div.
Agricultural Resources Div.
Aquatic Resources Div.
Geologic Resources Division (State Geologist, oil and gas)
Forest Practices Division
Resource Protection Division
Environment and Nat. Resources
Puget Snd. Wtr. Qual. Auth.
Energy Office
Ecology Department
Fish and Wildlife Department
Central Programs and Enforcement Of.
Central Programs
Air Programs
Environmental Investigations & Lab. Services
Water and Shorelands Office
Shorelands and Coastal Zone Management
Water Quality
Water Res. (quantity, rights)
Waste Management Office
Nuclear and Mixed Waste
Health and Human Services
Social & Health Services Dept.
Planning, Research and Dev. Div.
Research and Data Analysis (client and siting locations)
Employment Security Dept.
Employment and Training Division
Labor, Market and Economic Analysis
Health Department
Environmental Health Programs
Health Statistics (vital)
Radiation Protection (radon)

Washington - GI/GIS

West Virginia - GI/GIS

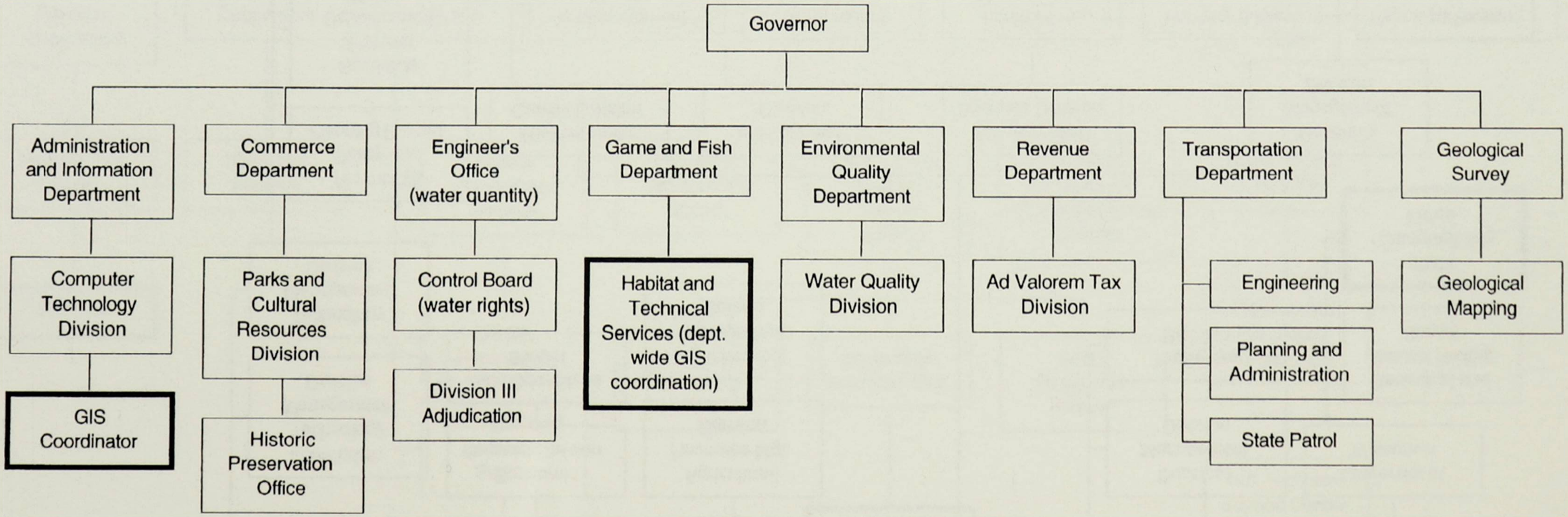

Governor
Agriculture Commissioner
Tax and Revenue Department
Transportation Department
Commerce Bureau
Environment Bureau
Administration Department
Higher Education Board
Agriculture Department
Property Tax Division
Highways Division
Natural Resources Division
Solid Waste Management Board
Environmental Protection Division (energy)
Information Services and Communications Division
West Virginia University
GIS Unit
Wildlife Resources
Geological and Economic Survey
Mining and Reclamation Office
Information Services Office
Water Resources Office
Geology and Geography Department
GIS Technical Support Center
GIS Coordinator's Office (statewide)
Technical Applications and GIS (division wide GI coordination)

Warnecke, 1995


Governor
Land Information Board
Administration Department
Health and Social Services Department
Agriculture, Trade and Consumer Protection Dept.
Natural Resources Department
Transportation Department
Board of Regents
Information Technology Management Division
Technology Management Division
Economic Support Division
Field Operations Bureau
Agricultural Resource Mgt. Division
Agrichemical Management Bureau
Business Management Division
Highways Division
University of Wisconsin
Geological and Natural History Survey
State Cartographer's Office
Technology Policy and Planning Bureau
Statewide Systems Development Bureau
Presentation Management Bureau
GIS Services Section
Environmental Quality Division
Air Management Bureau
Water Resources Management Bureau
Water Supply Bureau
Enforcement Division
Environmental Analysis and Review Bureau
Water Regulation and Zoning Bureau
Management Services Division
Information Management Bureau
Geographic Services Section (department wide GIS coordination)
Resource Management Division
Forestry Bureau
Fisheries Management Bureau
Wildlife Management Bur.
Endangered Resources Bur.
Research Bureau
Parks and Recreation Bureau
Property Management Bur.

Wisconsin - GI/GIS

Wyoming - GI/GIS



- Governor
  - Administration and Information Department
    - Computer Technology Division
      - GIS Coordinator
  - Commerce Department
    - Parks and Cultural Resources Division
      - Historic Preservation Office
  - Engineer's Office (water quantity)
    - Control Board (water rights)
      - Division III Adjudication
  - Game and Fish Department
    - Habitat and Technical Services (dept. wide GIS coordination)
  - Environmental Quality Department
    - Water Quality Division
  - Revenue Department
    - Ad Valorem Tax Division
  - Transportation Department
    - Engineering
    - Planning and Administration
    - State Patrol
  - Geological Survey
    - Geological Mapping

Warnecke, 1994

Alabama

Bob Grasser
Office of Water Resources
Department of Economic and Community Affairs
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Alaska

Kathryn Lizik
Research and Analysis
Department of Labor
P.O. Box 25501
Juneau, AK 99802-5504
(907) 465-2437 FAX 465-2101

Rich McMahon, Director
Land Records Information Section
Division of Support Services
Department of Natural Resources
3601 C Street, Suite 934
Anchorage, AK 99503
(907) 762-2384

Arizona

Gary Irish, Program Manager
Arizona Land Resource Information System (ALRIS)
State Land Department
1616 W. Adams
Phoenix, AZ 85007
(602) 542-4061 FAX 542-2590
EMAIL girish@lnd.state.az.us

Arkansas

Emmett Fry, Technical Planning Specialist
Department of Computer Services
Benton Building, Suite 205
10802 Executive Center Drive
Little Rock, AR 72211
(501) 682-4304 FAX 682-4310

Fred Limp, Director
Center for Advanced Spatial Technologies (CAST)
12 Ozark Hall
University of Arkansas
Fayetteville, AR 72701
(501) 575-4575 FAX 575-4846

California

Randall Moory, GIS Manager
Teale Data Center
P.O. Box 13436
Sacramento, CA 95813-4436
(916) 263-1886 FAX 263-1346
EMAIL randy@gislab.teale.ca.gov

Colorado

Marv Koleis
Division of Local Government
Department of Local Affairs
1313 Sherman Street, Room 521
Denver, CO 80203
(303) 866-3463 FAX 866-2251

Larry Schuford
Management Information Systems
Department of Natural Resources
1313 Sherman Street
Denver, CO 80203
(303) 866-3410 FAX 866-3415

Connecticut

Robert Dixon
Office of Information and Technology
Office of Policy and Management
80 Washington Street
Hartford, CT 06106
(203) 566-1234 FAX 566-3456

Jonathan Scull, GIS Coordinator
Department of Environmental Protection
79 Elm Street
Hartford, CT 06106
(203) 566-3540

Delaware

Rick Collin, Planning and Data Manager
Office of Information Systems
801 Silver Lake Blvd.
Dover, DE 19901
(302) 739-9621 FAX 739-6251

Richard Truitt, MAIS System Administrator
Dept. of Natural Resources and Environmental Control
89 Kings Highway
Dover, DE 19901
(302) 739-6308

Florida

David Stage
Marlyn Glascock
Information Resource Commission
Bloxham Building, Room 112
725 South Calhoun Street
Tallahassee, Florida 32399-0001
(904) 488-7986 FAX 922-5929

Ruth Roaza, GIS Coordinator
Bureau of Information Systems
Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400
(904) 488-0892 FAX 922-6041

Georgia

Dr. William McLemore
Geological Survey
Department of Natural Resources
Room 400
19 Martin Luther King, Jr. Drive, SW
Atlanta, GA 30334
(404) 656-3214

Sara Yurman, GIS Coordinator
Department of Community Affairs
1200 Equitable Building
100 Peachtree Street
Atlanta, GA 30303
(404) 656-3879 FAX 656-9792
EMAIL gdca@holonet.net

Hawaii

Craig Tasaka, Planning Program Manager
Office of State Planning
P.O. Box 3540
Honolulu, HI 96811-3540
(808) 587-2894 FAX 587-2899

Joy Toyama
Information and Communication Services Division
Department of Budget and Finance
1151 Punchbowl Street
Honolulu, HI 96813
(808) 586-1940 FAX 586-1922

Idaho

Hal N. Anderson, Chief
Technical Services Bureau
Division of Policy and Planning
Department of Water Resources
1301 N. Orchard Street
Statehouse Mail
Boise, ID 83720-9000
(208) 327-7888 FAX 327-7866

Illinois

Sheryl G. Oliver, GIS Manager
Energy and Environmental Assessment
Department of Natural Resources
325 W. Adams, Rm. 300
Springfield, IL 62704
(217) 785-8586 FAX 785-8575

Indiana

Bill Ashton
Data Processing Oversight Commission
Indiana Government Center South, Room W470
402 W. Washington St.
Indianapolis, IN 46204
(317) 232-0184 FAX 232-3530
EMAIL ashton@ideanet.doe.state.in.us

Indiana
Shelley Liu, GIS Coordinator
Department of Natural Resources
Indiana Government Center South, Room 255C
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Indianapolis, IN 46204
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Iowa
Kevin Kane, GIS Coordinator
Department of Natural Resources
Wallace State Office Bldg.
Des Moines, IA 50319
(515) 281-5815 FAX 281-8895
kk4631r@acad.drake.edu

Kansas
Rick Miller, State GIS Coordinator
Kansas Water Office
109 SW 9th, Suite 300
Topeka, KS 66612
(913) 296-0877 FAX 296-0878

Tom Mettille, DASC Manager
Kansas Geological Survey
1930 Constant Ave.-Campus West
Lawrence, Kansas 66046-2598
(913) 864-3965

Kentucky
Doug Robinson, Director
Office of Geographic Information
Finance and Administration Cabinet
1024 Capitol Center Drive, Suite 304
Frankfort, KY 40601
(502) 573-1460 FAX: 573-1458

Ken Bates, GIS Manager
Division of Administrative Services
Natural Resources and Environmental Protection Cabinet
500 Mero Street, 14th Floor Capital Plaza Tower
Frankfort, KY 40601
(502) 564-5174 FAX 564-6736

Louisiana
Sharon J. Balfour, Louisiana Water Resources Manager
Federal Projects, Room 437
Department of Transportation and Development
P.O. Box 94245
Baton Rouge, LA 70804
(504) 379-1477 FAX 379-1848

Glen Daigre, Planner
Division of Administration
P O Box 94095
Baton Rouge, Louisiana 70804
(504) 342-7410

Louisiana

Bo Blackmon, GIS Coordinator
Management and Finance Office
Department of Natural Resources
P O Box 94396
Baton Rouge, Louisiana 70804
(504) 342-4500

Maine

Nancy L. Allen, State GIS Coordinator
Bureau of Information Services
Department of Administration and Finance
State House Station #145
Augusta, ME 04333
(207) 624-7847 FAX 287-4563
EMAIL isnalle@gatekeeper.ddp.state.me.us

Daniel Walters, Manager
Maine Office of GIS
Bureau of Information Services
Department of Administration and Finance
State House Station #22
Augusta, ME 04333
(207) 289-3897 FAX 287-7641

Maryland

Bill Burgess
Water Resources Administration
Department of Natural Resources
Tawes State Office Building, D-2
580 Taylor Avenue
Annapolis, MD 21401-2397
(410) 974-2721 FAX 974-2618

Mike Lettre, Deputy Director
Maryland Office of Planning
301 W. Preston Street
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Massachusetts

Christian Jacqz, MassGIS Manager
EOEA Data Center
Executive Office of Environmental Affairs
20 Sommerset Street
Boston, MA 02108
(617) 727-5227 ext. 309

Elaine Socha
Strategic Planning Bureau
Office of Management Information Systems
One Ashburton Place, Room 1601
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(617) 973-0720 FAX 973-0761

Michigan
Michael N. Beaulac, MRIS Manager
Land and Water Management Division
Department of Natural Resources
P.O. Box 30028
Lansing, MI 48909
(517) 373-8000 FAX 373-9965

Maynard Dyer
Survey and Remonumentation Commission
Department of Commerce
116 W. Allegan St.
Lansing, MI 48933
(517) 373-3952

Minnesota
David Arbeit, Director
Chris Celak, Applications Manager
Land Management Information Center
MN Planning
330 Centennial Building, 658 Cedar Street
St. Paul, MN 55155
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EMAIL chrisc@lmic.state.mn.us

Mississippi
Paul Davis, MARIS Director
Mississippi Institutions of Higher Learning
3825 Ridgewood Road
Jackson, MS 39211
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Missouri
Jack Stewart, GIS and Database Administrator
Management Information Services Program
Department of Natural Resources
PO Box 176
Jefferson City, MO 65102-0176
(314) 751-1850 FAX 751-7749

Montana
Allan Cox, NRIS Director
Fred Gifford, GIS Manager
Natural Resource Information System
Montana State Library
1515 E. 6th Avenue
Helena, MT 59620-1800
(406) 444-5355 FAX 444-0581
EMAIL acox@nris.msl.mt.gov

Nebraska
Larry Zink
Intergovernmental Data Services Division
Department of Administrative Services
P.O. Box 94664
Lincoln, NE 68509
(402) 471-3206 FAX 471-4157
EMAIL lzink@doc.state.ne.us

Nevada
Ronald H. Hess, GIS Supervisor
Bureau of Mines and Geology
University of Nevada, Reno
M.S. 178
Reno, NV 89557-0088
(702) 784-6691 FAX 784-1709
EMAIL: rhess@nbmg.unr.edu

New Hampshire
James F. McLaughlin
Office of State Planning
2 1/2 Beacon Street
Concord, NH 03301
(603) 271-2155 FAX 271-1728

Fay Rubin, GIS Coordinator
Complex Systems Research Center
University of New Hampshire
Morse Hall
Durham NH 03824
(603) 862-1792 FAX 862-0188
EMAIL: fay.rubin@unh.edu

New Jersey
Henry L. Garie, Assistant Director
Pat Cummins, GIS Manager
Office of Information Resources Management
Department of Environmental Protection
401 E. State Street, CN 428
Trenton, NJ 08625-6070
(609) 984-6639 FAX 292-7340

New Mexico
Ann Gibson, Systems Analyst Manager
William S. Baillargeon, GIS Manager
Information Systems Division
Department of General Services
P.O. Drawer 26110
715 Alta Vista
Santa Fe, NM 87502-0110
(505) 827-2047 FAX 827-2325

Michael Inglis, Associate Director
RGIS Clearinghouse
Earth Data Analysis Center
University of New Mexico
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